SNEAK PREVIEW! MICROSOFT'S COOL NEW DOS 6.0

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January 1993

PC Computing

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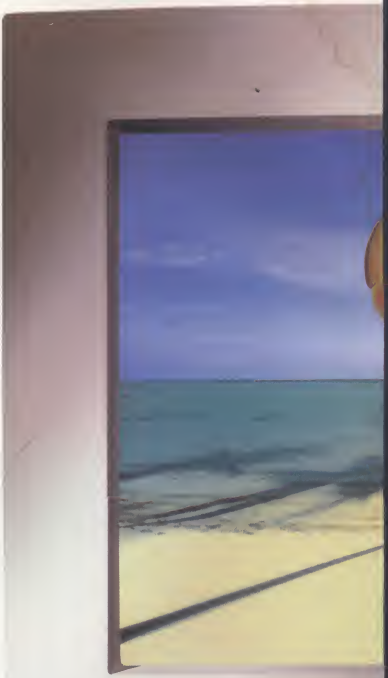

Circle 220 on reader service card.

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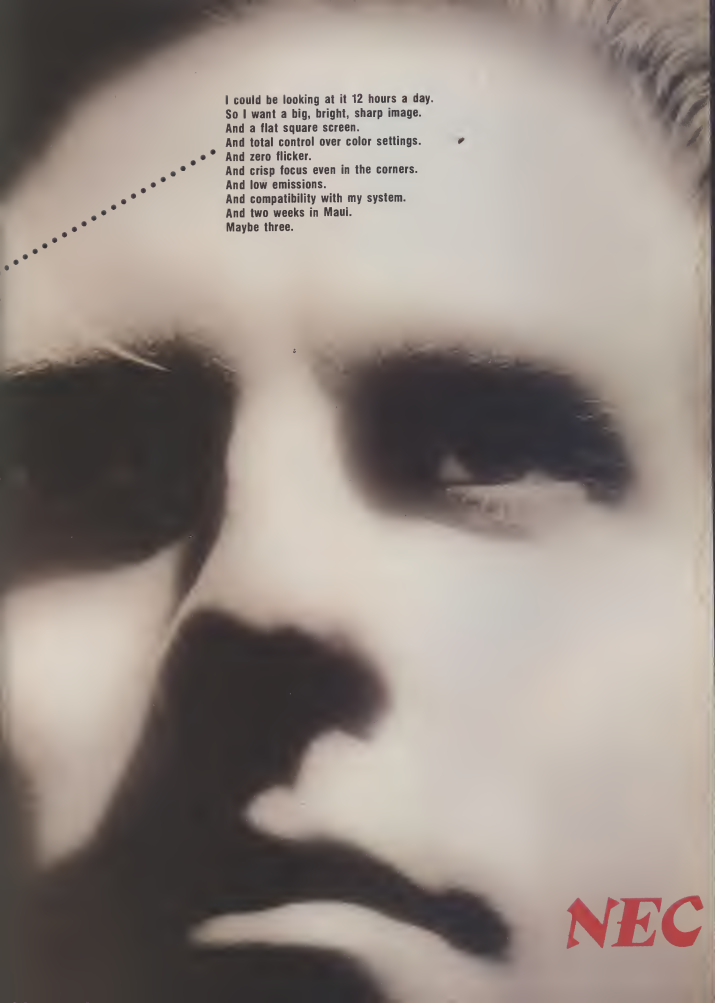
I could be looking at it 12 hours a day.
So I want a big, bright, sharp image.
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And zero flicker.
And crisp focus even in the corners.
And low emissions.
And compatibility with my system.
And two weeks in Maui.
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Cool savings.

ACCOUNTING/FINANCE

ACC PAC BPI Series 255
ACC PAC Simply Windows 135
DAC Easy Accounting 4.2 105
DAC Easy Accounting Upgrade 49
DAC Easy Bonus Pack 135
DAC Easy Payroll 4.2 69
Individual Stock Investor 69
M.Y.O.B. Windows 149
Managing Your Money 8.0 39
Money for Windows 55
Peachpay 55
Peachtree Accounting (Windows) 189
Peachtree Basic Accting 85
Peachtree Complete 199
Point-of-Sales Acctng 245
Quickbooks 95
Quickbooks/Quickpay 125
Quicken 6.0 49
Quicken Windows 49
Sales Order Acctng 245
Timeslips III 199
Turbo Tax Federal CALL
Turbo Tax State CALL
Willmaker 4.0 45

ENTERTAINMENT/GRAPHICS

CA Cricket Presents 35
Calendar Creator Plus 59
DrawPerfect 269
Easy Flow 7.0 169
Flowcharting III 149
Formfiller 3.0 89
Formtool Gold 3.0 65
Freelance Graphics DOS/WIN 339
Freelance Upgrade Win/DOS 99
Harvard Graph Win 365
Harvard Graphics 3.0 409
Harvard Graphics Win Upgrade 125
Hollywood 309
Labels Unlimited 69
Multimedia Make Your Point 55
Plus Ad[illegible]ed 69
Advanced Fo[illegible] 135
[illegible] 95
[illegible] 125
[illegible] Plus 2.0 [illegible]
[illegible] Plus [illegible]
[illegible] Pro [illegible] 79
[illegible] 78
[illegible] 93
[illegible] 59
[illegible] 97
[illegible]

Multimedia Make Your Point 55
Org Plus Advanced 69
Org Plus Advanced For Windows 135
Perform Professional 195
Stanford Graphics 359

CAD/DRAFTING

Design CAD 2-D 185
Design CAD 3D 259
Design CAD Professional 595
Dream House Professional 49
Easy CAD 2 119
Fast CAD 529
Generic CAD 6.0 289
Generic Home Series CALL

ON LINE

Hitachi CDR1700 External 639
Hitachi CDR3700 Internal 519
NEC CD Gallery/CDR-37 466
NEC CD Gallery/CDR-74 699
NEC CDR-84 Internal 599
Smart & Friendly CD 800 MAC 329
Smart & Friendly CD 800e 299
Smart & Friendly CD 900e 359
Smart & Friendly CD 900i 309
Sony CDU-535 Interface Kit 89
Sony CDU-535 Internal 329

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COMMUNICATIONS/NETWORKING

Blast Remote for Procomm 29
Carbon Copy Plus DOS/WIN 119
Close-up Cellular Support 129
Co Session Win/DOS 169
Crosstalk For Windows CALL
Crosstalk Mark II 145
Crosstalk XVI 149
Fax it! For Windows 89
Fantastic Products CALL
Laplink Pro 4.0 109
Laplink Pro Upgrade 59
Novell Products CALL
PC Anywhere 4.5 Host/Remote 119
PC Anywhere 4.5 Host/Remote 2.0 [illegible]
[illegible] Plus [illegible]
[illegible]

PC Anywhere 4.5 [illegible]
Host/Remote [illegible]
Procomm Plus 2 [illegible]
Procomm Plus W[illegible]
Q-Modem [illegible]
Remote 2 (Host [illegible]
Smartcom [illegible]
Smarterm [illegible]
Wildcat BBS [illegible]
Winfax Pro [illegible]
WordPerfect Office P[illegible] 95
Fax it! For Windows [illegible] 89
Fantastic Products [illegible] CALL
Laplink Pro 4.0 [illegible] 100
Laplink Pro Upg[illegible]
Novell Producti[illegible]
PC Anywhere 4[illegible]
Host/Remo[illegible]
Procomm Plus [illegible]
Procomm Plus [illegible]
Q-Modem [illegible]
Remote 2 (Host & Caller) [illegible]
Smartcom III [illegible]
Smarterm 420 For Windows [illegible]
Wildcat BBS [illegible]
Winfax Pro [illegible]
WordPerfect Office PC [illegible]
ARAGO DBXL 1.3 [illegible]
ARAGO Quicksilver 1.3 [illegible]
Clarion Personal Develo[illegible]
Cloper [illegible]
DataEase Express [illegible] 145
DataPerfect [illegible]
DB Fast Windows [illegible]
DBase IV 229
Family Tree Maker [illegible]
FileMaker Pro Window[illegible]
Foxbase Plus [illegible]
Foxpro 2.0 [illegible]
Foxpro 2.0 [illegible]
Instant [illegible] 55
Nutshell 229
[illegible] CALL
[illegible] CALL
[illegible]
[illegible] Express Publisher [illegible] 109
Fontmonger Windows 105
Fonts On the Fly 99
Free-land For Windows 409
Multi Fonts 79
Omnipage 386 3.0 469
[illegible] 529
[illegible]

Orbits 33
PC Globe 49
PC Study Bible 95
PC USA 35
Personal Training Systems CALL
Prep for the SAT 39
Science Adventure 49
Space Adventure
Spanish Assistant
Sports Adventure
Type!
Typing Tutor V DO[illegible]
Vista [illegible]
[illegible] CALL
[illegible] 139
[illegible] 45
[illegible]
[illegible] Version
[illegible] 239
[illegible] 145
[illegible]
[illegible] 29
[illegible] 399
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible] Draw Windows
[illegible]
[illegible] for Windows
[illegible] Illustrator Windows
[illegible] Image Pals
[illegible] Photofinish
[illegible]
[illegible] Presentation [illegible]
[illegible] Wildcat [illegible] CALL
[illegible] CALL
[illegible]
[illegible] 99
[illegible] Smart Suite Upgrade 339
[illegible] Stepway 99
[illegible] Works 2.0 105
[illegible] Works For Windows 135
[illegible] PC Anywhere 4.5 Host/Remote 119
[illegible] 1st Act 59
[illegible] Act! 229
[illegible] Windows CALL
[illegible] 59
[illegible] 99
[illegible] 45
[illegible] 95
[illegible] 99

Mathmatica 386 Windows 539
Sigma Plot 429
Statgraphics 5.1 689
Systat Dual 745
R&R Report Writer 4.0 195
Autodesk MM Explorer 129
CDPC MM Sub-System 1099
Labtec SS100 Speakers 29
Labtec SS200 Speakers 35
Labtec SS700 Speakers 39
MM Resource Kit 235
MM Toolbook 529
MM Upgrade Kit Ext 649
MM Upgrade Kit Int 585
Nec MM Upgrade Kits CALL
PC Animate Plus 125
Pro Audio Spectrum 16 235
Sound Blaster 119
Sound Blaster Pro 199
Sound Blaster Pro CD 199
[illegible]erboard 99
[illegible] Sound 35
[illegible] CALL
[illegible] 95
[illegible] 189
Hayes S[illegible] CALL
Modem Sharing Kit CALL
Optima 144 + Fax 144 499
Optima 24 149
Optima 96 359
Optima 96 +Fax 96 399
PM14400FX Send/Rec Fax 389
PM2400 V.42BIS 129
[illegible]00/9[illegible] Send/Rec Fax 109
[illegible]00/V.32/V.42 BIS 299
[illegible]ster 9600 319
[illegible]144 CALL
[illegible] CALL
[illegible] 58
[illegible] 139
[illegible] w/NetWare Lite 65
Dr. DOS Multiuser 489
Geoworks Pro 135
[illegible] DOS 5.0 75
[illegible] 155
PC DOS 5.0 149
PC DOS 5.0 Upgrade 69
PC Anywhere 4.5 Host/Remote 119
Procomm Plus 2.0 79
Procomm Plus Windows 89
Q-Modem 65
Remote 2 (Host & Caller) 119
Smartcom III 119
Smarterm 420 For Windows 179
Wildcat BBS 99
Winfax Pro 79
WordPerfect Office PC 95

[illegible]

ARAGO DBXL 1.3 145
ARAGO Quicksilver 1.3 345
Clarion Personal Developer 55
[illegible]oper 519
[illegible]se Express 115
[illegible]act [illegible] 295
[illegible] 339
[illegible] 529
[illegible]

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Foxpro 2.0 479
Foxpro 2.0 6-User Pack 535
Foxpro 2.0 Distribution Kit 309
Instant Database 55
Nutshell Plus II 229
Paradox 529
Q & A 4.0 265
R&R Report Writer 4.0 195
Rbase CALL
SCD Foxbase CALL
Superbase 4 - Windows 469

DESKTOP PUBLISHING & FONTS

By Design for WP 65
Express Publisher DOS/Win 109
Fontmonger Windows 105
Fonts On The Fly 99
Freehand For Windows 409
More Fonts 79
Omnipage 386 3.0 469
Pagemaker 529
Postscript Cartridge 259
Printshop Deluxe 55
Streamline Windows 135
Truetype Fonts CALL

EDUCATION/LEARNING

Auto Works 43
Automap 53
Automap Europe 75
Body Works 43
Chemistry Works 38
DINE Flight for Windows 95
Distant Suns Windows 55
Entertainment Pack For Win 2 35
Entertainment Pack For Win 3 35
French Assistant 49
[illegible] 45
Knowledge Adventure 49
Learning DDS 39
German Assistant 49
Italian Assistant 49
Kid Pix 45
Knowledge Adventure 49
Learning DOS 39
Orbits 33
PC Globe 49
PC Study Bible 95
PC USA 35
Personal Training Systems CALL
Prep for the SAT 39
Science Adventure 49
Space Adventure 49
Spanish Assistant 49
Sports Adventure 49
Type! 25
Typing Tutor V DDS/WIN 39
Vista Pro 75
Where is Carmen Series CALL

[illegible] ENTERTAINMENT

Falcon 3.0 35
Flight Simulator 4.0 49
Flight Simulator II 45
[illegible] 45
[illegible] 115
[illegible] 45
[illegible] 39

Go Master Deluxe 115
Jet Fighter II 45
Playmaker Football 39
Ultimate Golf 39

GRAPHICS & CLIP ART

Apprentice 89
Bannermania 29
Corel Draw 3.0 399
Corel Draw 3.0 Comp Upgrade 239
Corel Draw 3.0 Version Upgrade 55
Designer 469
Dr. Halo IV 479
Graphics Editor 399
Halo Desktop Imager 89
Harvard Draw Windows 429
Hijaak 105
Hijaak For Windows 139
Illustrator Windows 389
Image Pals 169
Photofinish 129
Photostyler For Windows 549
Picture Publisher w/Scanner 549
Picture Wizard 55
Presentation Task Force 129

INTEGRATED

Lotus Works 99
MS Office For Windows 489
PFS:First Choice 99
Smart Suite 469
Smart Suite Upgrade 339
Stepway 99
Works 2.0 105
Works For Windows 135

INFORMATION/PROJECT MANAGEMENT

1st Act 59
Act! 229
Act! For Windows CALL
Address Book Plus 59
[illegible] Date 99
[illegible]k Plus 45
[illegible]scriptions Write Now 95
Harvard Project Manager 459
CA Up To Date 99
Daybook Plus 45
Descriptions Write Now 95
Harvard Project Manager 459
Idea Fisher 359
Info Select 2.0 99
Lotus Organizer 99
Manage Pro 239
On Target Windows 269
On Time For Windows 99
Pack Rat Windows 249
Policies Write Now 169
Project for Windows 455
Timeline 5.0 455
Timeline Windows 485

MATHEMATICAL

Derive 2.0 155
Mathcad 3.0 Windows 319
Mathmatica 386 Windows 429
Sigma Plot 689
Statgraphics 5.1 745
Systat Dual

MULTIMEDIA

Autodesk MM Explorer 129
CDPC MM Sub-System 1099
Labtec SS100 Speakers 29
Labtec SS200 Speakers 39
Labtec SS700 Speakers 235
MM Resource Kit 529
MM Toolbook 649
[illegible] Upgrade Kit Ext 585
[illegible]yle Kit Int CALL
[illegible] Kits 125
235

MM Upgrade Kit Ext 649
MM Upgrade Kit Int 585
Nec MM Upgrade Kits CALL
PC Animate Plus 235
Pro Audio Spectrum 16 235
Sound Blaster 119
Sound Blaster Pro 199
Sound Blaster Pro CD 199
Thunderboard 99
Wired For Sound 35
Wired For Sound Pro CALL

MODEMS

Courier Modems CALL
ESP 189
Hayes Smartmodems CALL
Modem Sharing Kit CALL
Optima 144 + Fax 144 499
Optima 24 149
Optima 96 359
Optima 96 +Fax 96 399
PM14400FX Send/Rec Fax 389
PM2400 V.42BIS 129
PM2400FX96 Send/Rec Fax 109
PM9600 V.32/V.42 BIS 299
Sportster 9600 319
Ultra 144 CALL
Ultra 96 CALL

OPERATING SYSTEMS

Desqview 2.4 58
Desqview 386 2.4 139
DR DOS w/NetWare Lite 65
Dr. DOS Multiuser 489
Geoworks Pro 135
MS DOS 5.0 75
MS DOS 5.0 Upgrade 65
New Wave 119
OS/2 155
PC DOS 5.0 149
PC DOS 5.0 Upgrade 69
SCO Unix/Xenix CALL
VM/386 245
Windows 3.1 99
Windows 3.1 Upgrade 59

PERIPHERALS & ACCESSORIES

Ballpoint Mouse 129
Ballpoint Mouse W/Windows 3.1 149
Masterpiece Plus 109
Math Co-Processors CALL
Mouseman Cordless 99
Mouseman Serial 79
MS Mouse 95
MS Mouse w/Paint 109
MS Mouse w/Windows 3.1 165
Trackman Serial 59

PROGRAMMING

Borland C++ 325
Borland C++/W/App 499
Data Boss 349
Install Boss 69
Duick C For Windows 139
Smalltalk V 85
Smalltalk Windows 275
Toolbook 299
Turbo C++ 3.0 75
Turbo C++ For Windows 109
Turbo Pascal 6.0 109
Turbo Pascal Windows 149
Visual Basic 125
Windows Development Toolkit 325
Zortech C++ 475

SPREADSHEETS

123 for Home 99
Allways 129
CA Compete CALL
Excel 319
Excel For DS/2 325
Excel Upgrade 105
Lotus 123 Upgrade Win/DDS 99

Excel For OS/2 325
Excel Upgrade 105
Lotus 123 Upgrade Win/DDS 99
Lotus 123 V3.1 + 419
Lotus 123 Windows 399
Lotus123 V2.4 339
PlanPerfect 245
Duattro Pro DDS/WIN 319
Duattro Pro SE 55
Duattro Pro Upgrade 99
Wingz For Windows 335

UTILITIES

386 Max 6.0 59
After Dark Windows 35
Allsafe 95
Amish Utilities 59
Central Point Anti-Virus 75
Check It 89
Copy II Deluxe Dption Board 115
Copy II PC 6.0 39
Direct Access Windows CALL
Fastback Plus DDS/WIN 109
File Runner 85
Norton Antivirus DDS/Win 95
Norton Back Up DOS/Win 95
Norton Commander 99
Norton Desktop For Dos 99
Norton Desktop For Windows 99
Norton Editor 2.0 75
Norton Utilities 6.01 119
Novi Antivirus 85
Novi Antivirus Multi-Packs CALL
PC Kwik Powerpak 85
PC Tools Deluxe 8.0 129
PK Zip 55
Power Launcher 65

Print D 6.0 99
Q DDS III 55
DEMM 386 65
QRAM 55
"Ready, Aim, File" 65
Sidekick 2.0 65
Spinrite II 69
Stacker 89
Stacker W/coprocessor CALL
Superstor 79
Superstor Pro 95
Virusafe 69
X Tree Gold 2.5 99
X Tree Windows 49

WORD PROCESSING

Ami Pro V3.0 399
Ami Pro V3.0 Upgrade 99
CA Textor 149
Grammatik DDS/WIN 69
Just Write 165
LetterPerfect 99
Lotus Write 135
MS Word 229
MS Word For DS/2 339
MS Word For Windows 319
MS Word For Windows Upgrade 129
Professional Write 2.2 175
Professional Write Plus Windows 175
Rightwriter DDS/WIN 65
Screen Extender For WP 65
WordPerfect 5.1 279
WordPerfect 5.1 Windows CALL
WordPerfect Win Upgrade CALL
Wordstar 285

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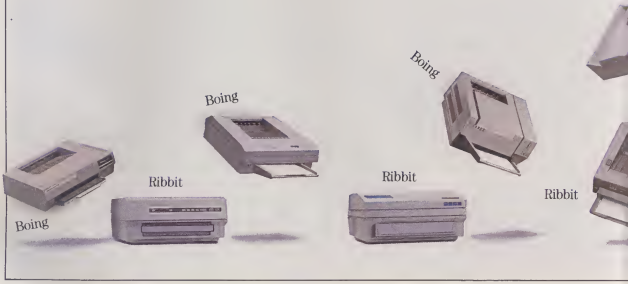
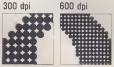
Circle 145 on reader service card.

Other laser printers play leapfrog trying to catch up with the HP LaserJet.



Of course, luck won't get them far. Because the new HP LaserJet 4 printer sets such high standards for performance, value and ease of use that no other laser printer comes close.

Higher resolution. More typefaces. With the HP LaserJet 4, HP has moved the standard for print quality from 300 dpi to 600 dpi. That's twice the old resolution, but at less than the old 300 dpi price.



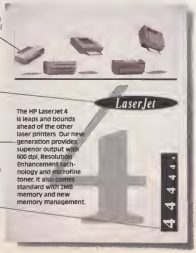
Four times the dots for better resolution

The HP LaserJet 4 was designed for 600 dpi printing from the ground up. Which gives you the best 600 x 600 dpi resolution ever for noticeably crisper, clearer text and graphics.

Add microfine toner and HP's exclusive Resolution Enhancement technology, and you get razor-sharp edges and much smoother curves. For impactful documents that really stand out.

You can dress them up with 45 scalable typefaces built right in. No matter what kind of document you're producing, your needs are covered. You'll also find it is easier and cheaper to use. You don't have to hassle with downloading fonts or buying accessory typefaces.

More speed, trays, and flexibility. Thanks to a high-speed RISC processor, the HP LaserJet 4 also sets new standards for speed. It prints many complex documents at rated engine speed, and many 600 dpi graphics print at a true 8 pages per minute. It's faster on networks, too. And has 2 MB built-in memory and new memory management.



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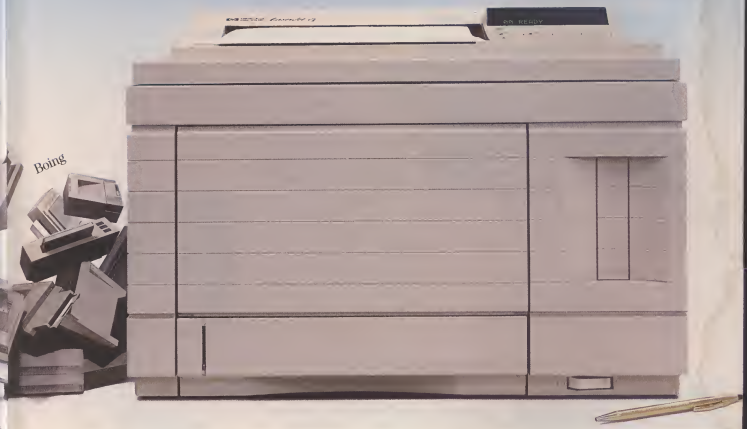
Introducing the HP LaserJet 4. Good luck, fellas!



It also makes you more efficient. Two standard paper trays give you a 350-sheet capacity. And there's an optional 500-sheet tray. So you can just keep on printing, instead of stopping to reload different sizes and types of paper.

With the new optional 75-capacity envelope feeder, you won't waste time with manual feeding. Or dealing with jams.

Faster Windows. True WYSIWYG. Windows printing, for both text and graphics, is much faster with the LaserJet 4. We use fast vector graphics and we built Windows 3.1 TrueType fonts right into the printer. This means documents print faster and What You See Is *really* What You Get. It's one simple, seamless operation. All you do is sit back and watch your screen document appear quickly, easily and accurately on paper.

You can't beat the LaserJet 4 printer for compatibility, either. It works with a wide variety of LANs and computers, as well as HP's PCL 5 printer language and HP's optional PostScript Level 2 software from Adobe. And automatically switches between these languages.

And, of course, it offers complete document and software compatibility with the HP LaserJet III printer.

Setting the standard in price, too. With all these advances and more, you'd expect a big jump in price.

Surprise! At just $2,199,* the HP LaserJet 4 printer lists for less than the printer it replaces. Yet it still comes with pace-setting HP quality and reliability.

Call **1-800-LASERJET** (1-800-527-3753), **Ext. 7132** for the name of your nearest authorized HP LaserJet dealer.† Also ask for a print sample so you can see for yourself how great the output really looks.**

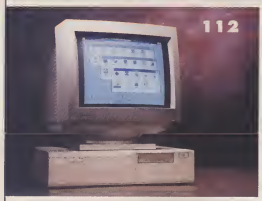
If it isn't a LaserJet, it's only a laser printer.

HEWLETT PACKARD

*Suggested U.S. list price. †In Canada call 1-800-387-3867, Ext. 7132. ** To have a LaserJet 4 printer data sheet sent immediately to you via fax machine, call 1-800-964-1291 from your touch-tone phone. Windows 3.1 is a product of Microsoft Corp. Adobe and PostScript are trademarks of Adobe Systems Incorporated which may be registered in certain jurisdictions.

PC Computing

HOTTEST Hardware of 1993



112 Brand Name Bargain PCs

MARTY JEROME

IBM, Compaq, and Dell labels now appear on PCs with prices that rival mail-order and superstore clones. Are brand name systems a better value than no-name clones? We review six 486/33 machines under $2,800 and compare them with top-of-the-line mass-market PCs. Find out which best suits your needs.

128 Notebook Torture Test

SCOT FINNIE

We froze them. We baked them. We shook them. We dropped, tumbled, and spilled coffee on them. When you're buying a high-ticket item that amounts to a second PC, durability is an important consideration. So find out how ten 486SX- and SLC-based notebooks fared in our little shop of horrors. We'll also tell you how to assess—before you buy—a notebook's predisposition toward durability.

PAGE 128 SEE WHICH NOTEBOOKS SURVIVED OUR LITTLE SHOP OF HORRORS

168 100 Best-Selling PC Products

PRESTON GRALLA

Learn what was hot and what was not, which PCs and printers were preferred above all others, which software topped the charts, and which headed south in 1992. Most important, discover what the top-selling hardware and software products of the year say about the way you compute today, and will compute tomorrow.

186 Cheap and Easy Windows LANs

DALE LEWALLEN

Get the benefits of a full-blown network—sharing data, peripherals, and applications—without hiring someone to install and administer it. We review five peer-to-peer local area networks that are easy to set up and operate from Windows, but that are just as powerful as dedicated server-based LANs. Find out which will help you retire the Sneakernet.

PAGE 168 TOP-SELLING SOFTWARE AND HARDWARE PRODUCTS OF 1992

212 This Old PC

WINN L. ROSCH

How should master renovator Bob Vila "remodel" his PC to keep pace with an expanding business? In this first of a new *PC/Computing* series, our own upgrade wizard takes him (and us) through the process.

227 Fax Poll: What Makes Software or Hardware Usable?

JANUARY 1993 VOLUME 6 NUMBER 1

DOS 6 SNEAK PREVIEW

see page 40

Help

230 **DOS** Organize your hard disk and make files easier to access

231 **DOS Hot Tips** Shorten your path, clear out old files, and more

234 **Windows** Fast Printing Direct to Port explained and exposed

236 **Windows Hot Tips** Dial from Windows, create PIFs, and more

240 **Software Secrets** Expert advice on popular apps and utilities

256 **Hardware Hints** Techniques for optimizing PC performance

260 **How It Works** Parallel ports

262 **Q&A** Authoritative answers to your most pressing PC questions

263 **Fast Facts** Hardware vendors' BBS numbers

272 **Toolkit** Password-protect your personal files

276 **How to Log On** Access PC/Contact, our online service

Consumer's Edge

280 **Cut Your PC's Electric Bill** Save big with EPA's Energy Star

281 **PC/C Advocate**

282 **Street Prices** Fast PostScript printers

284 **Phantom Shopper** Bargain hunting at Mall of America

284 **What to Ask** When buying a local-bus PC

Working Smarter

290 **Easy Money Management Software** Andrew Tobias' Managing Your Money 9.0, Balance Point 1.1A, CheckFree 3.0, Microsoft Money 2.0, Money Counts 7.0 Personal Edition, Quicken 6.0, Quicken for Windows 2.0, WinCheck 3.0P

Columns

20 **Ed Bott** Note to MIS: Pay attention to next year's best-sellers

29 **Letters** OS/2 debate continues; PCs and the environment

100 **John C. Dvorak** Debunking common assumptions

102 **John Dickinson** IBM's MicroKernel strategy

104 **Paul Saffo** Meet your colleagues in shared virtual reality

106 **Dvorak vs. Somerson** Will the megacompanies squelch innovation?

358 **Penn Jillette** A Brief History of Time: The Column

New!

Microsoft's DOS 6.0 _____ 40
Client support for networking, built-in utilities, and other cool features make this major upgrade more than just a glorified file manager.

WordPerfect's WordPerfect 5.2 For Windows _____ 41
Take an introductory tour through QuickFinder, the most advanced text-retrieval feature in any word processor.

Texas Instruments' TravelMate 4000 WinDX2/50MHz _____ 46

Stac Electronics' Stacker 3.0 _____ 48

Practical Peripherals' FaxMe _____ 48

Lotus's Improv for Windows _____ 58
Come on our Guided Tour and learn how to use its new and powerful data-analysis tools to view spreadsheet data from many perspectives.

Okidata's Doc.It 4000 _____ 60

Microsoft's TrueType Font Pack 2 _____ 60

Caere's PageKeeper 1.0 _____ 66

Nanao's FlexScan F340iW _____ 66

CompuServe's WinCIM _____ 68

Visage's TouchMate _____ 68

Broderbund's The Print Shop Deluxe for Windows _____ 72

Altra's Felix for Windows _____ 72

Five 386/25 Notebooks _____ 82
Compaq Contura 3/25, Contura 3/25c, Dell NL25, Toshiba Satellite T1850, T1850C

readware's AutoIndex _____ 82

HP's DeskJet 550C _____ 84

Power Up's Calendar Creator Plus for Windows _____ 84

Microsoft's Works 3.0 for DOS _____ 88

Intex Solutions' Tax Solver _____ 88

PC/C Update _____ 90
Compaq ProSignia, product upgrades, and short takes on the unusual.

Best Bets _____ 94
Free remote-control software.

Software Saleswire _____ 96

PRODUCT INDEX ▶

Product Index

PRODUCTS FEATURED IN THIS ISSUE
FOR FREE INFORMATION ON THESE PRODUCTS, CIRCLE THE CORRESPONDING READER SERVICE NUMBERS ON THE REPLY CARD ON PAGE 341.

PRODUCTS BY ARTICLE

To request information on all the products in one article, circle the corresponding number on the reply card on page 341.

Page Number		Reader Service
108	**...Brand Name PCs for Less** — AST Bravo 4/33, Compaq ProLineo 4/33, Dell Dimension, Digitol DECpc, IBM PS/1 Consultant, Zenith Z-Station 433DH.	731
124	**...10 Top-of-the-Line Notebooks** — ALR M486SX/25, BCC Avanti 486, Gateway 2000 Nomad 420SXL, Grid 1735/486SLC, and six more.	732
164	**...100 Best-Selling PC Products** — WordPerfect, MS-DOS 5.0, Windows, Lotus 1-2-3, QEMM-386, Procomm Plus, Word for Windows, Excel, and more.	733
182	**...Painless Peer-to-Peer LANs** — 10NET 5.0, InvisibleLAN 3.13A, LANtastic 4.1, MoinLon for Windows 1.04, and Windows for Workgroups 3.1.	734
290	**...Personal-Finance Programs** — Andrew Tobias' Managing Your Money 9.0, Bolance Point 1.1A, CheckFree 3.0, Microsoft Money 2.0, plus four more.	735

COMPUTER SYSTEMS

Page Number	Name/Company	Reader Service
	286-BASED SYSTEMS	
171	**...IBM PS/2** — IBM	601
	386-BASED SYSTEMS	
171	**...Dell 386** — Dell Computer	602
171	**...Deskpro Series** — Compaq	603
171	**...Equity** — Epson	604
171	**...Force, Legend** — Pockord-Bell	605
171	**...Gateway 386SX** — Gateway 2000	606
171	**...IBM PS/2** — IBM	607
171	**...NCR ELPC386SX** — NCR	608
171	**...Powermate** — NEC	609
171	**...Premium, Bravo** — AST Research	610
171	**...Slimline, Elegance** — Northgate 386	611
171	**...Tempo, Step** — Everex	612
171	**...Vectra** — Hewlett-Pockord	613
	486-BASED SYSTEMS	
110	**...Bravo 4/33 Model 123B** — AST Research	614
117	**...DECpc 433dxLP** — Digitol Equipment	615
171	**...Dell 486** — Dell Computer	616
171	**...Deskpro Series** — Compaq	617
113	**...Dimension 486 DX/33** — Dell Computer	618
171	**...Gateway 486** — Gateway 2000	619
171	**...IBM PS/2 486** — IBM	620
113	**...ProLineo 4/33 Model 120** — Compaq	621
118	**...PS/1 Consultant Model 215S-G76** — IBM	622
118	**...Z-Station 433Dh Model 120** — Zenith Doto Systems	623
	NOTEBOOKS—COLOR	
78	**.....Contura 3/25c** — Compaq	624
78	**.....Satellite T1850C** — Toshiba	625
	NOTEBOOKS—MONOCHROME	
129	**...Avanti 486** — BCC	626
78	**.....Contura 3/25** — Compaq	627
154	**...DecisionMate 486SLC** — Wyse Technology	628
171	**...Dell 386** — Dell Computer	629
78	**.....Dell NL25** — Dell Computer	630
133	**...Grid 1755/486SLC** — Grid Systems	631
171	**...LTE Lite/25** — Compaq	632
130	**...Nomad 4205XL** — Gateway 2000	633
133	**...PC Brand 486/SLC** — PC Brand	634
129	**...Ranger M486SX/25** — Advanced Logic Research	635
146	**...Slimnote 4SX/25** — Twinhead	636
134	**...Tandy 4800 HD** — Tandy	637
146	**...Toshiba T4400S** — Toshiba	638
46	**.....TravelMate 4000 WinDX2/50MHz** — Texas Instruments	639
138	**...TravelMate 4000** — Texas Instruments	640
171	**...Turbosport** — Zenith Doto Systems	641

PERIPHERALS

Page Number	Name/Company	Reader Service
	PRINTERS—COLOR	
80	**.....DeskJet 500, 500C, 550C** — Hewlett-Pockord	642
179	**...DeskWriter** — Hewlett-Pockord	643
179	**...Stylewriter** — Apple	644
	PRINTERS—DOT MATRIX	
179	**...Epson LQ-570, LQ-1170, LQ-870** — Epson	645
179	**...Okidoto 320, 321, 380** — Okidoto	646
179	**...Panasonic P1180, P1124i, P2123** — Ponosonic	647
	PRINTERS—LASER	
179	**...LaserJet II Plus, III, IIID, IIIP, IIIsi** — Hewlett-Pockord	648
60	**.....Okidoto Doc.It 4000** — Okidoto	649
179	**...Okilaser 400** — Okidoto	650

WINDOWS SOFTWARE

Page Number	Name/Company	Reader Service
	ACCOUNTING/PERSONAL FINANCE	
296	**...Bolance Point 1.1A** — Moon Volley Software	651
302	**...Money 2.0** — Microsoft	652
308	**...Quicken for Windows 2.0** — Intuit	653
310	**...WinCheck 3.0P** — Wilson WindowWore	654
	BUSINESS TOOLS	
175	**...Office for Windows** — Microsoft	655
	COMMUNICATIONS	
167	**...Procomm Plus for Windows** — Dotostorm	656
	DATABASES	
175	**...Approach** — Approach Software	657

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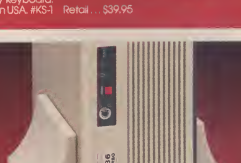

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Product Index

Page Number ... Name/Company — Reader Service

DESKTOP PUBLISHING

175 ... **PageMaker** — 658
Aldus

175 ... **Publisher for Windows** — 659
Microsoft

DOCUMENT MANAGEMENT

66 ..... **PageKeeper 1.0** — 660
Caere

DRAWING (VECTOR-BASED)

175 ... **Windows Draw** — 661
Micrografx

EDUCATIONAL/GAMES

68 ..... **CompuServe Information Manager for Windows** — 662
CompuServe

FONT MANAGEMENT

167 ... **Adobe Type Manager** — 663
Adobe Systems

72 ..... **The Print Shop Deluxe/Windows** — 664
Broderbund

60 ..... **TrueType Font Pack 2** — 665
Microsoft

GRAPHICS/PRESENTATION

175 ... **CorelDraw** — 666
Corel

175 ... **Harvard Graphics** — 667
Software Publishing

INTEGRATED

169 ... **Micrasoft Works for Windows** — 668
Microsoft

NETWORKS/UTILITIES

187 ... **10NET 3.0** — 669
Tiara Computer Systems

188 ... **InvisibleLAN 3.13A** — 670
invisible Software

194 ... **LANtastic 4.1** — 671
Artisoft

197 ... **MainLan for Windows 1.04** — 672
DocEasy

167 ... **NetWare Lite** — 673
Novell

198 ... **Windows for Workgroups 3.1** — 674
Microsoft

OPERATING ENVIRONMENTS

167 ... **Norton Desktop for Windows** — 675
Symantec

OPERATING SYSTEMS

167 ... **Windows 3.1** — 676
Microsoft

SPREADSHEETS/UTILITIES

175 ... **Excel** — 677
Microsoft

58 ..... **Improv for Windows Release 2.0** — 678
Lotus

UTILITIES

167 ... **After Dark** — 679
Berkeley Systems

WORD PROCESSORS/TEXT UTILITIES

175 ... **Ami Pro** — 680
Lotus

175 ... **Grammatik** — 681
Reference Software

175 ... **Ward for Windows** — 682
Microsoft

41 ..... **WordPerfect 5.2 for Windows** — 683
WordPerfect

DOS SOFTWARE

ACCOUNTING/PERSONAL FINANCE

294 ... **Andrew Tobias' Managing Your Money 9.0** — 684
Meca Software

300 ... **CheckFree 3.0** — 685
CheckFree

302 ... **MoneyCounts 7.0 Personal Edition** — 686
Parsons Technology

169 ... **QuickBooks** — 687
Intuit

304 ... **Quicken 6.0** — 688
Intuit

ANTIVIRUS

167 ... **Norton AntiVirus** — 689
Symantec

BUSINESS TOOLS

175 ... **Calendar Creator Plus** — 690
Power Up Software

169 ... **PFS:Resume and Job Search Pro** — 691
Spinnaker

DATA COMPRESSION

167 ... **Stacker 3.0** — 692
Stac Electronics

DATABASES

175 ... **dBASE** — 693
Borland International

175 ... **FoxPro** — 694
Microsoft

175 ... **Paradox** — 695
Borland International

175 ... **Q&A** — 696
Symantec

EDUCATIONAL/GAMES

169 ... **AutoMap** — 697
AutoMap

169 ... **Expert Home Pack** — 698
SoftSync

169 ... **Family Tree Maker** — 699
Banner Blue

169 ... **KidPix** — 700
Broderbund

169 ... **Micro Cookbook** — 701
Pinpoint

169 ... **New Math Blaster Plus** — 702
Davidson

169 ... **The New Print Shop** — 703
Broderbund

169 ... **Oregon Trail** — 704
MECC

169 ... **The Playroom** — 705
Broderbund

169 ... **Prodigy Start-Up Kit** — 706
Prodigy

169 ... **Reader Rabbit 2** — 707
Learning Company

169 ... **Where in America's Past Is Carmen Sandiego?** — 708
Broderbund

169 ... **Where in the USA Is Carmen Sandiego?** — 709
Broderbund

169 ... **Where in the World Is Carmen Sandiego?** — 710
Broderbund

FILE TRANSFER

167 ... **LapLink Pro** — 711
Traveling Software

FLOW CHART

175 ... **Flow Charting 3** — 712
Patton & Patton

INTEGRATED

84 ..... **Microsoft Works 3.0 for DOS** — 713
Microsoft

MEMORY MANAGERS

167 ... **QEMM-386** — 714
Quarterdeck

OPERATING ENVIRONMENTS

167 ... **Desqview** — 715
Quarterdeck

OPERATING SYSTEMS

167 ... **DR DOS** — 716
Digital Research

167 ... **MS-DOS 5.0** — 717
Microsoft

40 ..... **MS-DOS 6.0** — 718
Microsoft

REMOTE ACCESS

167 ... **Carbon Copy** — 719
Microcom

167 ... **Close-Up** — 720
Norton-Lambert

SPREADSHEETS/UTILITIES

175 ... **Lotus 1-2-3** — 721
Lotus

175 ... **Quattro Pro** — 722
Borland International

TAX

169 ... **TaxCut 1991** — 723
Meca Software

169 ... **TurboTax 1991** — 724
ChipSoft

UTILITIES

167 ... **Norton Utilities** — 725
Symantec

167 ... **Norton PCAnywhere** — 726
Symantec

167 ... **PC Tools** — 727
Central Point Software

WORD PROCESSORS/TEXT UTILITIES

167 ... **FaceLift for WordPerfect** — 728
Bitstream

175 ... **WordPerfect** — 729
WordPerfect

OS/2 SOFTWARE

OPERATING SYSTEMS

167 ... **OS/2 2.0** — 730
IBM

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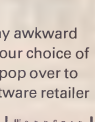

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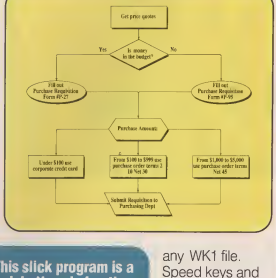

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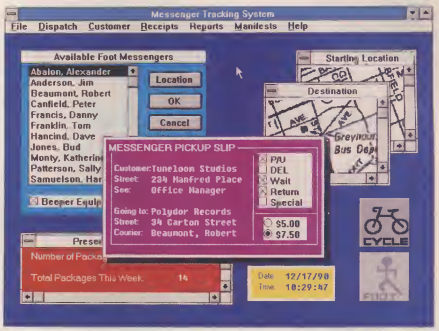

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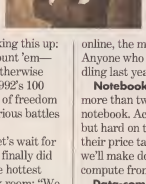
Get a Clue, MIS! Pay Attention To Next Year's Best-Sellers

IT'S A BUSINESS SCENARIO WE KNOW ALL TOO WELL: THE year's hardware and software gotta-have-it list is signed, sealed, and ready for requisitions. Now the headache is convincing MIS to buy what we've asked for, not the two-year-old technology they've finally learned how to support. It should be no contest. After all, it's our money. We're the experts on business computing. So why, year after year, do we have to battle MIS departments who haven't done real work on a PC since 1983?



Why did half the Windows systems we ordered last year show up with wimpy 40MB hard drives and one meg of memory? Who scratched out the line for a dozen LaserJet IIIPs and bought 840 decibels' worth of dot matrix printers instead? The only possible explanation is that some out-of-the-loop MIS people got their hands on the order. I'm not making this up: Relics like the 286-based PS/2 Model 50 and—count 'em—*four* 9-pin dot matrix printers cluttered up our otherwise stellar list of 1992's best-selling products (see "1992's 100 Best-Selling PC Products," page 168). The price of freedom is eternal vigilance. Do you remember these glorious battles of years gone by?

In 1991 they delayed purchasing DOS 5.0. "Let's wait for Version 5.1" was the refrain for six months. (We finally did the upgrades ourselves.) Last year Excel 4.0, the hottest new application of the year, got stuck in the back room: "We wanted to make sure there aren't any compatibility problems." (Translation: "We just figured out the last one.") For one brief shining moment, MIS standardized on 16 MHz 486SX boxes. (We marveled at their ability to find a steady supply of those white elephants.)

This year I'm ready for MIS, with a list of next year's best-sellers and an ironclad case for every product on it. Check out the top ten categories on *PC/Computing*'s 1993 PC budget:

An ironclad defense of the Top 10 PC product categories for 1993.

486s by the carload. They're cheap, powerful, and a cinch to upgrade, and they run circles around 386s. So why would you want to mess with anything else? Gateway 2000 was the first big PC maker to figure it out; these days, you've got to beg Gateway to sell you a 386. Let's send the 386 into retirement.

Presentation-graphics software. Who cares what your job title is? In the nineties, we're all selling something. If Ross Perot had used Freelance Graphics or Persuasion, he might be president today.

Color printers. When your presentation blows everyone away in 16 million colors onscreen, why settle for handouts that look like 16 shades of mud? Within a few months, a top-quality, network-ready color printer should sell for about the price of a laser printer. If you had planned to buy three new LaserJets, why not get two LaserJets and a sleek new color printer instead?

Networks everywhere. Windows for Workgroups (a Best Value in this month's review of peer-to-peer LANs) does every trick you want a network to do, and then some. Best of all, it looks just like Windows, so MIS guys probably won't notice that you installed it two months ago.

Big monitors. Once you've worked with Windows on a 17-inch monitor, anything smaller seems like a Gameboy.

High-speed fax/modems. What do you get when you cross e-mail with Windows? Big files, and bigger phone bills. A fast modem (9,600 bits per second or faster) pays for itself in a matter of days: The more time you spend online, the more you save. Hold out for a fax/modem, though. Anyone who tries to sell you a modem that can't fax is peddling last year's hardware.

Notebooks, especially color notebooks. If you spend more than two or three days a month on the road, you need a notebook. Active-matrix color displays are easy on the eye, but hard on the bottom line. Maybe by the end of the year their price tags won't be so breathtaking. In the meantime, we'll make do with a pool of monochrome notebooks that can compute from coast to coast on a single battery charge.

Data-compression software. Is it me, or are hard drives getting smaller? Did someone devalue the megabyte while I wasn't looking? Even a 200MB hard drive is pathetically small for a serious Windows user. Superstor and Stacker are the simple cures today. Wait a couple of months, and MS-DOS 6.0 will catch up with DR DOS 6.0; both have disk-doubling software built in.

Application software. We'll buy a shipload of word processors and spreadsheets this year, both for new systems and as upgrades. But there's one genuinely new category on our list: Windows databases. SuperBase 4? Microsoft Access? Paradox for Windows? Finally, we can put the dBASE dot prompt behind us.

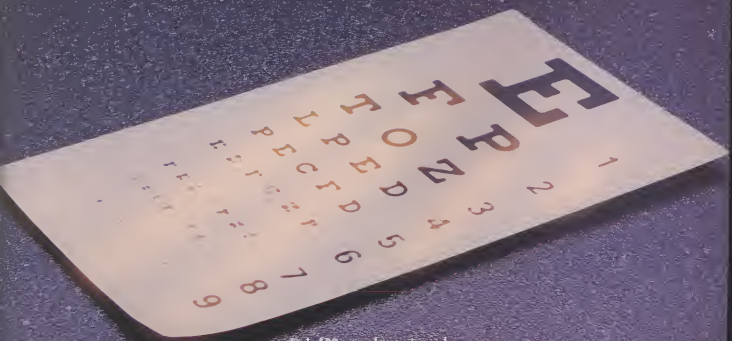
Sound. Yes, sooner or later we'll all embed voice annotations in spreadsheets and send them around the network like little voice-mail bombs. But now all I want is to be able to click on an icon and make my PC quack like a Mac. Is that a crime?

Do you have an incredible MIS tale to tell? Send your horror story to MIS Madness, *PC/Computing*, 950 Tower Lane, 20th Floor, Foster City, CA 94404. As always, we'll print the best comments in a future issue.

PHOTO BY ANTHONY BOCCHICCHIO

"Anyone who claims that computers are indistinguishable from one another needs glasses."

—Bill Machrone,
PC Magazine, October 13, 1992



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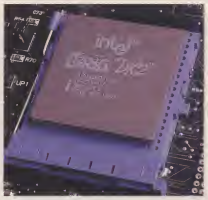

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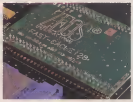

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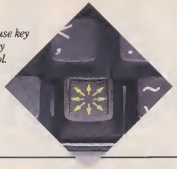

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Mi[illegible]		
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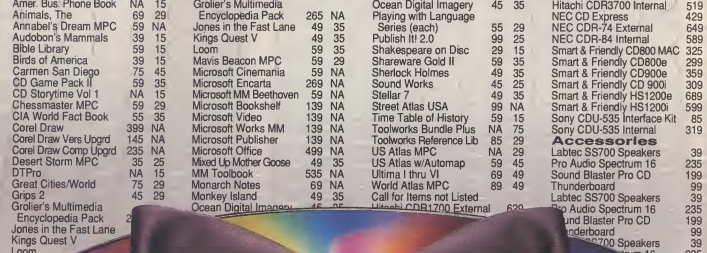

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OS/2: A Dream or a Nightmare?

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Is OS/2 for You?

Ed Bott is absolutely correct in concluding that "OS/2 2.0 Proves Again That No Good System Software Ends in .0" (October 1992, page 20). I upgraded to OS/2 2.0 through an offer in a magazine, and the package arrived a week later. That's when my nightmare in the OS/2 vortex began. After eight days of installing and reinstalling, my fifth phone call was to the customer service department at IBM to request a refund and to return the operating system. They promptly granted my request, and I am now a faithful DOS and Windows user. I guess I'll have to wait for Windows NT to come out to try 32-bit technology.

MICHAEL BENZ
VIA COMPUSERVE

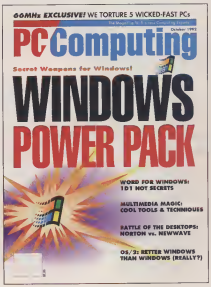
I found the article "OS/2 2.0: See How It Runs" (October 1992, page 190) to be an example of biased interpretation of statistics. You imply that the speed at which an application performs certain tasks is the greatest indication of the functional superiority of an operating system or environment. I couldn't disagree more. In most instances, you're speaking of mere seconds—seconds I would be happy to wait in exchange for reliable background operation. I certainly haven't been plagued by your so-called performance hit while multitasking DOS applications under OS/2.

DAVID BELTON
FRANKLIN, MASSACHUSETTS

After ending almost two years of rah-rah reporting about Windows 3.0—the most bug-infested program I have ever seen—you now tell people to avoid OS/2 because of .0? Talk about a double standard. I've been running OS/2 2.0 since March on a First Computer 386-25 with 8MB of RAM, and I am very pleased with the results. I recommend OS/2 to everyone using a computer, especially new users. OS/2, dead? No way, baby—it's alive and kicking MS but!

DEWAYNE EPLEY
KENNESAW, GEORGIA

An unbiased review of OS/2 2.0 could identify many legitimate disadvantages—



lack of high-resolution video drivers and heavy hardware requirements, for example. It would also point out several OS/2 advantages that users can take advantage of now: customized environments for DOS applications, an object-oriented work space and background floppy disk formatting, and multiple boot to different operating systems. OS/2 can copy an entire high-density floppy in one pass, something that DOS should have been able to do years ago. The big issue is whether it makes sense to be using workstation-class 32-bit PCs with a 16-bit operating system that has been patched up with memory managers, TSRs, and a third-rate GUI?

MARK R. BRUEGGEMAN
LONG BEACH, CALIFORNIA

The Politics of Printing

You render an excellent service by running an article on recycling ribbons and cartridges ("The Environmentally Correct PC," October 1992, page 234). This is a contribution to society and to readers—a win/win situation.

DAVID SALTMAN
WANTAGH, NEW YORK

Why can Qume pay $5 for a cartridge, but HP and Canon can only donate 50 cents to the National Wildlife Federation and the Nature Conservancy? The best idea seems to be to send the cartridge to Qume, send a dollar to the National Wildlife Federation, and pocket the remaining $4.

JON BOCZKIEWICZ
GAINESVILLE, FLORIDA

As an environmental scientist of 36 years' tenure, I read about the environmentally correct PC with interest. The author may be a good computer scientist, but a knowledgeable environmental scientist she ain't. Using fresh, unrecycled paper does not kill a tree in a virgin forest. Using No. 1 grade redwood and/or western cedar lumber for designer decks does. Such high-quality lumber comes only from old-growth stands for timber. Most paper, on the

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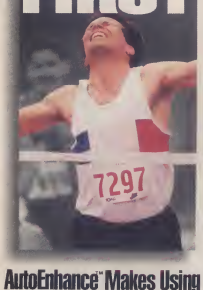

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other hand, comes from trees grown on tree farms by paper companies. The trees are harvested like any other agricultural crop, except it takes years instead of months to produce a crop. Also, in defense of reasonable timber harvests, trees do not live forever, and some cutting of old growth is simply using a resource before it becomes unusable.

LOREN W. MOSELEY
KANSAS CITY, MISSOURI

In "The Environmentally Correct PC," much is made about one's inability to sell or give away old software. Despite any comments by the Software Publishers Association (SPA), when I am done with any copyrighted material that I have bought and own, I can give it away or sell it as I choose. Be it for a recording, book, photograph, or software, the copyright only prohibits me from copying it, not disposing of it. While the SPA might imagine that its licensing agreements have weight, I doubt that any court, faced with years of precedents in other publishing fields, would seriously consider upholding the license, especially since it is not a condition negotiated between owner and consumer, but rather is arbitrarily imposed by the publisher and generally hidden within the shrink-wrap to be found only after purchase.

ELIIS GLAZIER
LA PAZ, MEXICO

Me and My Grammatik

This letter is in reference to your article on grammar-checking software ("Mark Your Words with Grammar-Checking Software," October 1992, page 243). I have used Grammatik for three years, beginning with III, then IV, and now 5 (DOS). (Notice the psychological improvement in their move from Roman to Arabic numerals.) I first purchased the program when I was under deadline to complete a thesis project. Grammatik helped me fine-tune some rough places in a very short time.

WILLIAM REAGAN
DENVER, COLORADO

Armchair Traveling

My compliments on your whirlwind article "Around the World in Eighty Minutes" (October 1992, page 200). As an armchair globetrotter myself, I have one additional comment regarding France Telecom's Minitel videotex service: It's available here in the United States and can be easily accessed via more than 300 local telephone nodes for an average of 40 cents per minute, plus local telephone charges. Currently more than 14,000 informational services that can be read in English and French are available. The students in our local high school can read the news, play games, or correspond and chat on Minitel. It is no longer necessary to take class trips to France or to francophone Canada to practice one's high school French.

PAUL J. MARKOWITZ
FRANKLIN LAKES, NEW JERSEY

Easier Done than Said

I found George Beinhorn's "101 Hot Tips for Word for Windows" (October 1992, page 122) extremely helpful. However, tip No. 16, "Create Envelopes on the Fly," makes an easy task very difficult. Rather than using his ten-step method after typing a letter, I simply highlight the address at the beginning of the letter, click on the envelope icon on the Word toolbar, and click on Print Envelope. This icon should be visible when Word is loaded; if not, select Create Envelope from the Tools menu.

DAVID P. LASNICK
STAMFORD, CONNECTICUT

Searching for Enable

I agree with the October 1992 letter (Letters, page 25) whose author calls Enable one of the best-kept secrets in software. In 1990, it took me four days to find Enable in the Bay Area. The program does not have all the bells and whistles of other packages, but it does have an easy-to-use word processor, a spreadsheet, a DBMS, and a telecommunications module. This package does it all for me, even though there are no icons and you have to be able to read and write to use the pull-down menus.

THOMAS K. BALDENWECK
SAN MATEO, CALIFORNIA

Measuring Monitors

I have noticed that some monitors' display dimensions are quite different from

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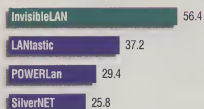

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Letters

Wanted: PC Hand-Me-Downs

A few months ago, we asked our readers what happens to hardware that's past its prime. The majority of respondents to that fax poll didn't have a simple answer. Most indicated several courses of action, such as donating some machines to nonprofit organizations, giving away others to employees, and selling the rest. Many respondents from smaller businesses reminded us that charity begins at home, and they said they give their old PCs to family and friends so that they can get started with computers.

Some companies sell their older hardware to help offset the cost of newer replacements, while a few trade it in when purchasing new PCs. And many respondents take yet another course of action, such as passing it down to other departments in the company that don't yet have PCs, storing it in a central place (usually because it's company policy), dedicating it to a single task such as fax or voice mail, using it as a network terminal, or selling it for scrap. Companies with large quantities of broken-down or obsolete computers and other equipment may consider taking this last route.

But the fax poll also drew responses from numerous organizations that would be thrilled to receive hardware hand-me-downs. Here is what some of them had to say:

Wicomico Country Schools

101 Long Ave.
P.O. Box 1538
Solisbury, MD 21802
Contact: Patricio Weeg, Delmor Elementary School, (410) 896-2780; and East Solisbury School, (410) 749-3488

Weeg writes, "I have a modem in my lab at Delmar Elementary School, and my students are involved in telecommunications through the METNET BBS's 800 number. We send and receive e-mail from all over the world. The kids love it, and I'm trying to involve other teachers and schools, but we don't have modems for them. Do you know of anyone who wants to donate slower speed modems (1,200 bits per second) to schools as they upgrade?"

Through this global communication, students practice writing, learn about current events, and become computer literate. In addition to modems, the schools could also use older PCs in the classrooms for composing e-mail offline. Weeg reminds businesses that donating old hardware to schools is really in their best interest, because they will see a return someday in the form of computer-literate adults.

Museums Research Associates

11 Spring St.
Hollowell, ME 04347
Contact: Ron Kley or Jone Radcliffe, (207) 395-4837

Kley and Radcliffe are database consultants who have worked with museums throughout the country for 50 years. Through their network they've learned about many museums, especially at the local level, that can't afford computer equipment. They write, "As a pro bono contribution to the community we serve, we would be pleased to help match perspective donors of hand-me-downs with recipients that can make good use of the equipment." They aim to place these older computers within the community from which they came, for example in a local historical society, or, if the donor desires, even in a foreign country.

The Access Group

1776 Peachtree Rd. NW, Suite N310
Atlanta, GA 30309
Contact: Bonnie Wootten Webb, (404) 888-0505

The Access Group is a project of United Cerebral Palsy Associations. It offers technology information and assistance to families of Vietnam veterans with disabled children. Webb writes, "We are soliciting donations of old equipment to be used with our families." The Access Group is a local network partner of the National Cristina Foundation.

Family Shelter Service

P.O. Box 646
Glen Ellyn, IL 60138
Contact: Colleen M. Wilson, (708) 469-5652

Family Shelter Service is a nonprofit agency that serves victims of domestic violence in Illinois's DuPage County. Writes Wilson: "We are attempting to computerize many of our operations, and we are entering the world of computing from various stages of manual processing. We are somewhat restricted in our endeavors due to lack of funding, yet our needs are always increasing."

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1991, 1990

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the advertised dimension. I am using a "16-inch" monitor, according to the box. But when I put a tape measure on the screen's usable picture, I see it is only 14 inches. Everyone I've talked to couldn't care less about the total glass measurement. Please tell us what we can see.

N. B. NARCOWICH
SAN JOSE, CALIFORNIA

Intel's Pentium Coup

What a marketing coup that Intel is naming the fifth-generation 80x86 chip Pentium. Obviously, *pent* means 5, and *ium* is "marketingese" for element. The real coup is the name for the sixth-generation CPU. Imagine the appeal of a computer chip named "Sexium." How will Intel pronounce this? "Sexy one," or "Sex yum"? Who says Japan is the leader in chip technology?

ROB SPEAR
VIA PC/CONTACT

Support Acronym Definition

I wholeheartedly endorse the SAD (Support Acronym Definition) campaign that was discussed in your October letters (page 27).

Yes, it may be somewhat redundant and tacky to define DOS (disk operating system) with first usage in every article, but SAD will ease our introduction to the ever more complex world of computing and continue your publication's place as the preeminent choice of the business computer user.

PHIL REYNOLDS
ROCKAWAY, NEW JERSEY

The Shareware Solution

Regarding the debate over software piracy (Letters, October 1992, page 28), it seems to me that both sides would be more comfortable with shareware. The software publishers would be rewarded based on the practical value of their programming: The packages that successfully combine power and ease of use would still turn a profit that would be sufficient to fuel the development of new software, and the large houses would save a bundle on advertising costs. The customers would have the opportunity to test the programs before they would have to pony up the big bucks, and I think most of them would certainly pay the registration fee for software that demonstrates good value.

I'm sure that Ken Wasch and others at the Software Publishers Association would argue that my view is very naive and that shareware also lends itself to piracy. I say that there are no absolute safeguards against theft, and that a business relationship in which both sides are more likely to trust one another will ultimately be more beneficial to everyone involved.

STEVE VACHULA
NORTHAMPTON, MASSACHUSETTS

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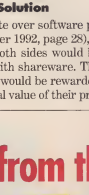

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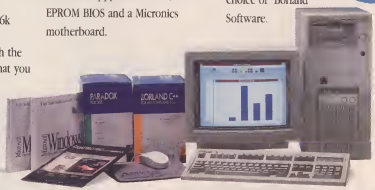

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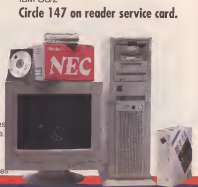

Put Users First

It is no more necessary to understand the workings of a computer or be able to read C code to use a spreadsheet or word processor (Letters, October 1992, page 26) than it is to know how electricity gets from the power plant to your neighborhood to turn on a light.

What programmers and human interface designers need to keep in mind is that for more than 90 percent of us users, *how* is meaningless if *what* isn't right. I have been using personal computers since late 1984, mostly for spreadsheets and word processing. I happen to be intrigued by the performance differences between hardware platforms and software packages. The difference between good and bad code isn't response time and ease of enhancement; it's whether the user's needs are being met.

JAMES ARTHUR
HOUSTON, TEXAS

The UPS Price War

To follow up on last September's "What To Ask" column on purchasing uninterruptible power supplies (Consumer's Edge, page 354): Now that a price war has brought their cost down to about $139, users are getting a false sense of security when they buy one.

Both vendors and past articles in many publications have convinced users that the UPS is the ultimate source of power protection and will solve all problems. This is not true. As manufacturers cut costs to meet low retail price points, they must omit features to save money. Unfortunately, on the very low end, the features that are removed are surge protection and EMI/RFI noise filtration. All the buyer really gets is a battery in a box.

In addition, putting a UPS on a computer does not guarantee that the computer will not lose data and/or not be damaged in the event of a power surge. A surge can come through the network across the data lines and destroy the computer.

BRIAN GUSTAFSON
SAN RAFAEL, CALIFORNIA

Clarification

Due to incorrect information from Microsoft, we reported in the New! section of the November 1992 issue that the Windows Sound System isn't Ad-Lib compatible. The Sound System is Ad-Lib compatible.

Mail your thoughts to Letters, PC/Computing, *950 Tower Lane, 20th Floor, Foster City, CA 94404; fax us at (415) 578-7029; or contact us via MCI Mail at* PCCOMPUTING *or via PC/Contact, our online forum. Letters must be signed and must include a daytime phone number. All letters become the property of* PC/Computing *and will be edited for length and clarity.*

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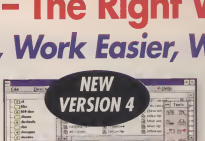

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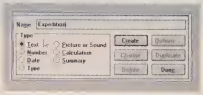

Defining fields is as easy as deciding what kind of information you want them to contain, giving them a name and then simply clicking a mouse.

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The Most Popular OS Keeps Going

MS-DOS 6.0 Boosts Networks and Windows

MAJOR UPGRADE
The rumors are true: The new DOS will includes utilities like the ones listed below, but it will also include much more. Notice that the new capabilities listed below are less focused on performance than on added value and work-group capabilities. Also note that DOS and Windows will work together better—a big bonus.

MS-DOS HAS A new lease on life—at least until 32-bit operating systems take over. Believe it or not, DOS 6.0 will be out by the end of spring. And from the looks of it, DOS 6.0 will be almost as big an improvement over DOS 5.0 as DOS 5.0 was over the oh-so-buggy DOS 4.0.

We took an early look at the new offering in Microsoft's Redmond, Washington, labs, and we were impressed: Unlike DOS 5.0, the new DOS won't include any fundamental improvements in speed or size, but it will include functions that finally make DOS much more than just a glorified file manager.

Network It

One of the most important new features in this release is DOS client support for networking. The system we examined lets DOS users access files and printers on servers running programs like LAN Manager, Windows for Workgroups, Pathworks, LAN Server and Microsoft's future Windows NT. While Windows for Workgroups (see New!, December 1992, page 38) won't work as a DOS client in its release, the new DOS compensates. This is the first time Microsoft has attempted to put networking capabilities into DOS. Though the beta was still sorely missing a NetWare requester, Microsoft officials assure us that support will be included in the final release.

Another new network capability is mail support—specifically, support for Microsoft Mail networks. DOS 6.0 will include a complete copy of the client software for Microsoft Mail, so all you'll need to do is purchase the server program, called Microsoft Post Office, for a complete e-mail package. (If you've got Windows for Workgroups, don't worry: It includes Microsoft Post Office and Mail.)

Another cool feature we found in DOS 6.0 is called Clean Boot. Clean Boot lets you select which parts of your CONFIG.SYS and AUTOEXEC.BAT files to execute—an invaluable feature for trouble-shooting your system or systems on a network.

Utilities Abound

We also discovered a number of built-in utilities, based on full-blown programs from leading companies like Symantec and Central

What's New in DOS 6.0?

- DOS client support for networking

- Online documentation

- Access to DOS utilities from Windows' File Manager

- Utilities: file transfer, virus detection, backup, and data compression
- DOS client support for Microsoft Mail
- Clean Boot, which executes isolated parts of your CONFIG.SYS and AUTOEXEC.BAT files
- A new version of SmartDrive

Point. For many users, these will be ideal. Included are mini-apps for transferring files, undeleting, detecting viruses, backing up files, and compressing data.

Like the data-compression software bundled with DR DOS 6.0, the data-compression package in MS-DOS 6.0 automatically compresses and decompresses files transparently to the user. Using compression, you can double your hard disk capacity. Though we don't expect it to work as fast as, say, Stac Electronics' Stacker, it will certainly introduce a new generation of users to data compression.

In this release, Microsoft is taking the opportunity to enhance a number of other DOS features as well, officials say. Online documentation, a new version of SmartDrive enhanced to work with DOS 6.0's data-compression feature, and a smarter memory manager will all be added.

Though DOS 6.0 won't give you any more room for running DOS apps than DOS 5.0, the new memory manager will be optimized for running Windows applications. The memory manager will also include a graphical memory viewing tool, which was the biggest omission in Version 5.0.

Smarter with Windows

Our favorite aspect of DOS 6.0, though, is the fact that it lets you access the new DOS backup, undelete, and antivirus utilities from the Windows File Manager. As everyone who hates switching between DOS and Windows well knows, that's a major improvement.

What does all this mean for applications vendors? They will, as always, accuse Microsoft of trying to wipe out their markets, but the fact is that if you want a serious backup, diagnostics, or data-compression package, you'll still want to buy the real thing.

Impressed? So were we. And these are just the first few details we learned about. As DOS 6.0's release date nears, we should be hearing even more. Stay tuned.

GINA SMITH

A Much-Improved WordPerfect For Windows Also Innovates

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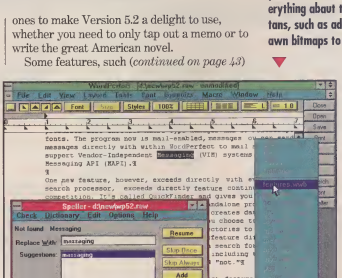
FIRST, THE NEWS that WordPerfect 5.1 for Windows users have been waiting for: Version 5.2 fixes the word processor's two most irritating problems—graphics that disappear and move of their own free will, and the program's insistence on performing a lengthy update of the printer's configuration every time you change printers. But working with a late prerelease version of 5.2, we couldn't create a situation in which graphics suddenly moved to another page or to never-never land. And changing printers no longer involves a time-wasting trip to the coffee pot.

In themselves, these fixes are enough to instill rejoicing among WordPerfect for Windows users who've otherwise been happy with the program's mix of power and usability—which is as good as you can find in any word processor. But WordPerfect Corporation has thrown in several new features and polished some old ones to make Version 5.2 a delight to use, whether you need to only tap out a memo or to write the great American novel.

Some features, such (*continued on page 43*)

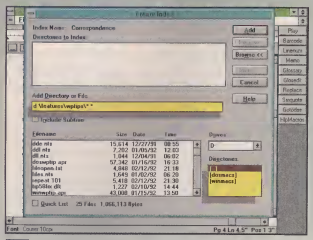


LOOK CLOSELY
Some of the additions to WordPerfect 5.2 for Windows are obvious, and others are subtle. QuickFinder, WordPerfect's new text-retrieval feature (see the Guided Tour "QuickFinder Whips the Text-Searching Capabilities Found in Other Products," page 42) is the coolest, but you'll find lots of other new features as well.

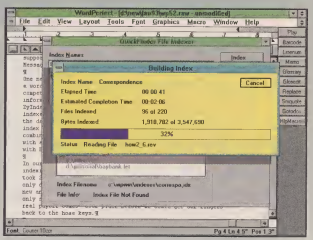
The screen below shows two of them: an improved, faster spell-checker and a list to select alternative button bars that appears when you tap the right mouse button on the current button bar. We found alternative button bars to be a big advantage for customization. However, you can't customize everything about the buttons, such as adding your own bitmaps to them.

New!

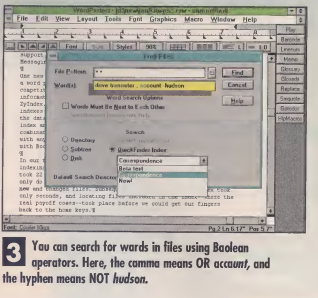
QuickFinder Whips the Text Searching Capabilities Found in Other Products



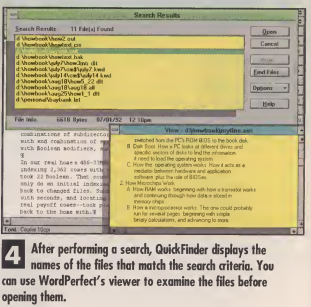
1 WordPerfect for Windows' QuickFinder is the most advanced text-retrieval feature in any word processor. A Browse feature lets you scroll through directories and use a mouse to select the directories and files you want to index.



2 While indexing files, QuickFinder provides a running account of the number and percentage of files indexed in both a text and a bar graph.

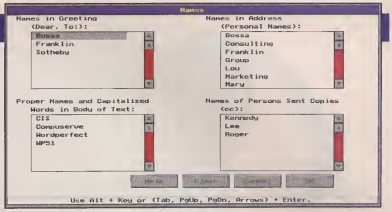


3 You can search for words in files using Boolean operators. Here, the comma means OR *account*, and the hyphen means NOT *hudson*.



4 After performing a search, QuickFinder displays the names of the files that match the search criteria. You can use WordPerfect's viewer to examine the files before opening them.

WORDPERFECT, *from page 41*
as object linking and embedding support, are long overdue. Others, such as a translation to Word for Windows 2.0 format and a Windows-based installation, have never been crucial, but are nice all the same.



Text Retrieval

One new feature, however, exceeds anything you'd ever expect from a word processor and shows how WordPerfect is staying ahead of the competition. It's called QuickFinder, and it gives you text database/retrieval features that are similar to those in a standalone program such as ZyIndex (see the Guided Tour, opposite). QuickFinder creates text databases that index every word of the files that are included in the databases. You can select which subdirectories to include in an index, and you can create indexes with different combinations of subdirectories. Then you can search for documents with combinations of specific words, including combinations of the Boolean modifiers AND, OR, and NOT.

In our tests on a 486/33 PC with a fast cached hard drive, we indexed 2,362 files with a total size of about 60.5MB in 22 minutes. That sounds like a long time, but you usually do an initial index and then update the index with new and changed files. Subsequent updates of our test index took only seconds, and QuickFinder located files that were included in the index—where the real payoff comes—before our fingers returned to the home keys.

Some Drawbacks

QuickFinder is a blessing, but it has some serious flaws. The most egregious is that there's no way to regularly, automatically update the indexes. If the indexes aren't current, QuickFinder won't be used, and that would be a shame. Another flaw is QuickFinder's poor interface. Using QuickFinder's Browse feature, you must select the same directory twice to add it to an index. And QuickFinder desperately needs some buttons to insert its Boolean operators into search requests. Someone looking at the Find Files dialog box for the first time would have no idea that Boolean searches are possible, much less how to do them.

Other minor—but still welcome—changes to WordPerfect for Windows include new button bar collections and a way to switch among them by clicking the right mouse button. For macro mavens, the program includes several new commands, including one to modify WordPerfect's main menus and one to change printers (the lack of this command has been a sore point with some users). Version 5.2 also provides ready-built macros that improve on the program's previous envelope macro, create typographically correct "smart" quotes, and convert acronyms into the words they abbreviate.

WordPerfect 5.2 for Windows goes further than necessary to reestablish WordPerfect's reputation in the Windows arena, where Word for Windows and Ami Pro have been battering WordPerfect on both features and ease of use. In particular, the advanced text retrieval is worth the price of admission. If WordPerfect improves this much with only an incremental update, we can hardly wait to see what shows up in Version 6.0 expected later this year.

RON WHITE

A QUICKFINDER ALTERNATIVE

WordPerfect for DOS users hankering for WordPerfect 5.2 for Windows' QuickFinder feature have a choice: Wait for WordPerfect 6.0 for DOS (due out later this year) or get Correspondence Manager from Utley-Cross Software (508-263-0386).

The $89 Correspondence Manager indexes every word in WordPerfect files and puts the information into a database. The program can also search documents for patterns that are likely to be names, parts of an address, a signature and an addressee, and so on. Correspondence Manager then adds this information to the database in specific fields. When you search on a field such as author or city, you get a list of the indexed words.

The beauty of this system is that you don't have to fill out the summary screen when saving documents—Correspondence Manager sorts the information for you. Even QuickFinder doesn't do that. RON WHITE

What's New in WordPerfect 5.2?

- **Improved printer-driver updating**
- **Improved graphics handling**
- **QuickFinder information management/text retrieval**
- **Windows-based installation**
- **Object linking and embedding support**
- **Grammatik 5.0 grammar checker**
- **Adobe Type Manager and 13 PostScript fonts**
- **Support for Microsoft and other mail products**
- **Additional button bars and easier button bar selection**
- **Smart quotes, glossary, envelope, and other macros**
- **New macro commands**

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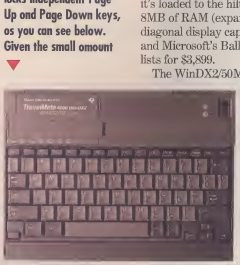
TI's Wicked-Fast Clock-Doubled 486 Notebook Comes Loaded

A So-So Keyboard

Texas Instruments' WinDX2/50MHz does almost everything right. What's the catch? For starters, the keyboard lacks independent Page Up and Page Down keys, as you can see below. Given the small amount of screen real estate you get on a notebook computer, the ability to page through your work with separate keys is important. Also, small function and cursor-control keys are problems.

On the upside, the response, size, and spacing of the QWERTY keys impressed us. Our verdict: The keyboard's OK, but not perfect.



WHAT'S THE FASTEST notebook you can buy? There's no contest: Texas Instruments' WinDX2/50MHz.

This 6.3-pound portable powered by Intel's 25MHz/50MHz clock-doubled 486 comes in the same slim form factor as the rest of the TravelMate 4000 family (8.5 by 11 by 1.8 inches), yet it's loaded to the hilt with a 200MB hard drive, 8MB of RAM (expandable to 20MB), a 10-inch diagonal display capable of 64 levels of gray, and Microsoft's BallPoint pointing device. It lists for $3,899.

The WinDX2/50MHz blazed through lab tests—it even put our 33MHz 486 Compaq Deskpro 4/33i to shame in processing and memory chores. TI outfitted the notebook with a speedy hard drive as well as one of the fastest video subsystems we've seen on a portable. It performed CPU-intensive tests nearly 35 percent faster than the Tandy 4860, a 486/33 notebook; Windows benchmarks nearly 22 percent faster; and our DOS-based Lotus 1-2-3 benchmark, which is heavy in I/O tasks, 10 percent faster.

Despite a quick video chip set and driver, however, refresh rates on the sidelit monochrome display can't keep pace with the CPU. Menus and tool bars cloud the display during screen redraws, and scrolling through a directory turns text into a blur. Contrast on the Sharp-manufactured display was good, however, and the display is a vast improvement over other models in the TravelMate family.

Most surprising about the WinDX2 is its battery life: 3 hours and 25 minutes in our rundown tests with all power-management features turned off. This is a longer charge than many 386SL-based notebooks can claim, and it's certainly better than any 486-based notebook we've seen (it's 1 hour and 21 minutes longer than the Tandy 4860). TravelMates have long enjoyed a reputation for holding their charge, and even with a power-hogging clock-doubler chip running the show, battery life on the WinDX2 is impressive. Texas Instruments accomplishes this feat partly through its core logic chip, which can switch the real-time CPU speed to 0MHz when the processor is idle. Two benefits result: The DX2 chip, which can get scorchingly hot, stays cool, and overall power consumption plummets. The WinDX2 also supports Microsoft's Advanced Power Management specification and comes with the TravelMate's canny, Windows-based BatteryPro power-management features.

One crafty ergonomic feature is Microsoft's BallPoint trackball—soon to appear on other notebooks. It connects directly to a proprietary port on the right side of the unit (tough luck, southpaws). Best of all, Windows recognizes the device even if you attach it after the GUI is loaded in memory.

The WinDX2/50MHz sets a new standard for power Windows computing on the road.

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The Texas Instruments WinDX2/50MHz combines long battery life with blazing performance. The screen's slow refresh rate blurs text during a scroll, but the display offers good contrast.

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Hewlett-Packard presents the DeskJet for the jet set. The new HP DeskJet Portable printer lets frequent travelers create great-looking documents anywhere they go.

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To top it off, the DeskJet Portable has a price tag befitting its small size. Just $599.* Who says you can't take it with you? For the name of the authorized HP dealer nearest you, call 1-800-552-8500, Ext. 7108.† To receive information by fax, call 1-800-333-1917, choose HP FIRST, document #9606.

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JUST WHEN YOU thought Stacker had gone as far as data-compression software could go, Stac Electronics takes it further. With the release of Stacker 3.0 for DOS and Windows, the program is much more versatile and easy to use. And if you use the new Stacker instead of the old version, you'll notice marked system performance enhancements.

The improvements become obvious as soon as you begin installation—which used to be a stumbling block for many users. Stacker now allows you to start the installation process in Windows or in DOS. If you want to keep it simple, you can invoke an express installation from either environment. If you prefer to set parameters yourself, you can use the custom installation.

One of the parameters you can set is a speed/compression ratio. When we selected Best Speed, Stacker 3.0 compressed 41,541,632 bytes of data into 22,452,736 bytes of storage. With the Best Compression setting selected, the same data was squeezed into 22,444,544 bytes, an improvement of 8,192 bytes.

We compared Stacker 3.0's compression ratio to the previous version's and found that the new version doesn't conserve much more space, but Stacker still offers a high overall compression ratio—1.8-to-1. When we installed SuperStor Pro on the same system, we received a compression ratio of only 1.6-to-1.

While tweaking Stacker's speed/compression ratio didn't really affect compression, it did significantly impact performance. Without Stacker, our test system took 24 seconds to start Windows. Because compressed files can be read with fewer disk accesses, we were able to start Windows in 23 seconds using Stacker tuned for Best Compression. But when Stacker was set for Best Performance, our system started Windows in just over 21 seconds. Our recommendation: Always select Best Performance.

Stacker 3.0 is not just easier to install—its also simpler to use. A set of Windows and DOS utilities make it easy to monitor Stacker's performance, adjust the performance/compression ratio, adjust the size of stacked disks, and add new stacked disks to the system.

When you elect to add a new stacked volume, Stacker allows you to select a floppy disk. Once a floppy has been stacked, you can now read and write compressed data to it on any computer, whether or not it is running Stacker.

Stacker 3.0 baasts easier installatian and defragmentatian utilities. Yau can set performance and campressian parameters and view graphical results, as shawn here.

We loaded 2.1MB of data on a standard 1.4MB floppy that had been stacked.

Other new features include password protection and two types of defragmentation. Each compressed volume can be assigned a password for read-and-write or read-only privileges. If you want to improve system performance, you can invoke one of Stacker's two defragmentation routines: The quick optimizer puts each file into one contiguous area but may leave free space fragmented; the full optimizer takes longer but leaves files and free space in contiguous blocks.

If you're constantly deleting files to make room for new ones, you have a choice: You can either purchase a new hard drive or add a data-compression system. For only $149 ($49.95 for upgrades), we strongly recommend Stacker 3.0 for DOS and Windows.

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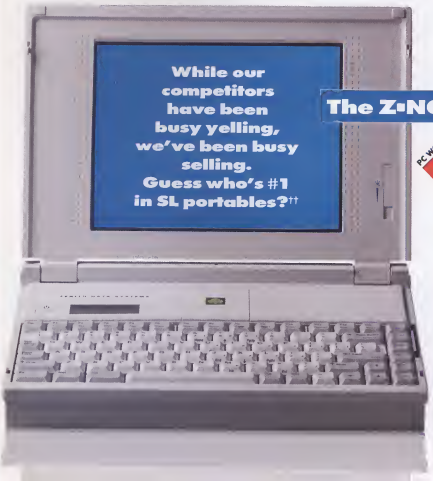

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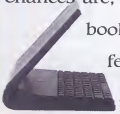

Chances are, what those new lightweight subnotebooks you're considering are light on are features and functionality. Especially if you use Microsoft Windows. So it's a good thing you've discovered new Z•LITE 320L. Because no lightweight does Microsoft Windows like Z•LITE. Z•LITE combines every heavyweight feature you need to run Microsoft Windows in an ultra-lightweight PC. Like the power of Intel 386SL technology—instead of the no-name chip others foist off on you.

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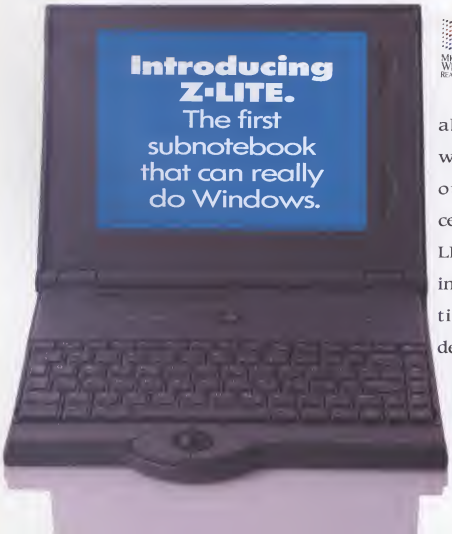

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The first 3.3V 386SL subnotebook.

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CONNER

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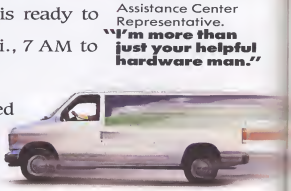

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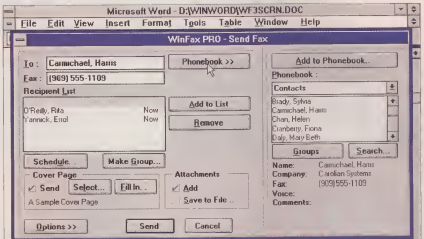

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New!

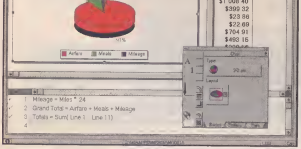
See Spreadsheet Data from Many Angles with Improv

PLAIN LANGUAGE

Improv brings many new spreadsheet concepts to the table, many of which are focused on usability.

At the bottom of the screen below, notice that formulas are built in plain English and that the formulas are logged in chronological order. The benefit to this is that you can see the underlying logic to your worksheet without having to jump from cell to cell. The Guided Tour on the next page further illustrates what this underlying logic means in real use, when creating a multidimensional model.

Also note the InfoBox—a quick way to work with formatting tools—at lower right on the screen below.



LOTUS'S NEW IMPROV for Windows is like a Ginsu knife: It slices, dices, cuts, chops, and presents your data like no other spreadsheet. And that's not all: You also get a powerful data-analysis tool with integrated charting and presentation features. Improv for Windows is a must-have program for business users who need to consolidate spreadsheet data and view it from many perspectives.

Dynamic Views

Unlike traditional spreadsheets, Improv doesn't present a tabula rasa interface in which you build models. With Improv, you enter data into a structured model and then use formulas to describe relationships. This approach extends the flexibility of traditional spreadsheet data by allowing you to create dynamic views of data. In many cases, creating these views would be so difficult in a traditional spreadsheet that you just wouldn't do it. But because you enter the formula relationships only once in Improv, you avoid common errors that result from copying formulas from one cell to the next. It takes practice, but once you get going, it's a great way to work with data (see the Guided Tour "A Multidimensional Spreadsheet Model in Improv for Windows," opposite).

Creating a model with Improv is easy. Several tools help you create the skeleton of your model: a SmartFill feature, which will automatically enter a series of dates or numbers; Quick Menus, which pop up at the tap of the right mouse key; and InfoBoxes, a new way to work with styles, formats, and colors. The InfoBoxes remain onscreen, permitting you to make several changes and selections without having to return to the menu.

After you have entered the structure of the model and optionally entered your data, move your mouse to the formula pane and use English formulas to describe the relationships of the data. For example, to show the value of stock on hand in a warehouse, your formula might look like On Hand = Quantity * Value Of Item. The immediate benefit of this approach is that you can see the formulas and logic of your model quickly and easily, without having to jump from cell to cell. With the formulas so easy to see and the logic so easy to follow, Improv for Windows models are inherently self-documenting.

Improv works particularly well in situations where there are more than three or four *dimensions*, or categories, of data. For example, say you want to view a budget with months in the columns and line items in the rows. Any spreadsheet can handle this task without breaking a sweat. But now add the dimension of actual vs. budgeted items. With most spreadsheets, this is harder but still possible. Improv surpasses the traditional spreadsheet with its ability to easily present and analyze this model by the additional dimensions of year, department, city, and so on. In fact, Improv can concurrently model up to 12 categories of data.

Supports Excel Files

While most DOS-based spreadsheet data resides in Lotus 1-2-3 files, most Windows-based spreadsheet data is in Excel 3.0 and 4.0 format. Consequently, Improv supports all versions of Lotus 1-2-3 files (that is, all WK1 and WK3 files), Excel 4.0 files (but not 3.0), and delimited ASCII data. When you import a file, Improv preserves all the styles and numeric formats and can even examine the existing formulas and labels in your worksheet and attempt to create Improv-style formulas. Finally, if you just want to grab a couple of rows of data from another application, Improv supports dynamic data exchange and object linking and embedding as both a client and server.

Improv for Windows isn't for everyone, and it isn't necessarily meant to replace your current spreadsheet. But if you need to look at spreadsheet data in different ways and to compare numbers that are otherwise difficult to compare, Improv belongs on your PC.

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IMPROV FOR WINDOWS RELEASE 2.0, $495
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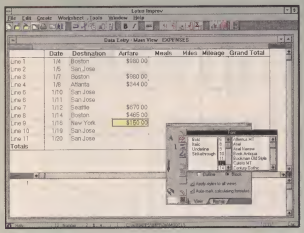
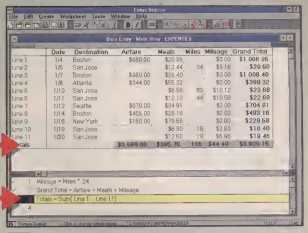
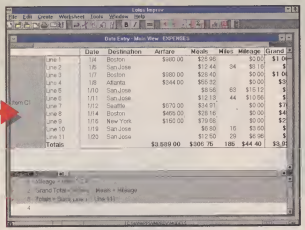
A Multidimensional Spreadsheet Model in Improv for Windows



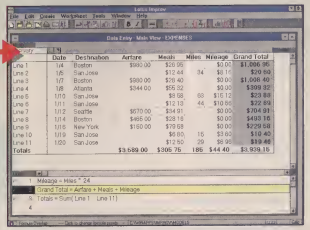
1 First, create the model's structure by entering basic raw and column information. You can also enter your data at this point. Use Improv's InfoBox to change the properties of your model, including the typeface, paint size, and color of the text. Many of the menu items are duplicated in the InfoBox or on Lotus's SmartIcons, just under the menu bar.



2 After you create the structure, add formulas to describe the logic of the model. Note the use of English formulas. Note also that when you highlight a formula in the formula pane, the results are highlighted on the worksheet. Here, formula No. 3 calculates the sum of lines 1 through 11.



3 Adding a *dimension*, or category, to your model is as easy as choosing the Create, Category command. Improv adds a new category with one item by default (shown here as item C1) that you can name—we renamed this one January. Pressing the Enter key 11 times gave us the rest of the month and duplicated formulas and logic.



4 Note how the data is now presented monthly. This required one step—dragging the category tile from one place onscreen to another. Clicking on the buttons to the right of the January label moves through the months. Note how easy it is to understand formula No. 2 and how Improv highlights the portion calculated by that formula.

Okidata's Doc.It 4000 Scans, Faxes, Copies, Prints—And Costs

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WHAT LOOKS LIKE a printer and acts like a printer, but also serves as a scanner, a plain-paper fax machine, and a convenience copier? The answer is Okidata's Doc.It 4000. Okidata has incorporated a scan head, internal fax/modem, and software to its LED printing technology and created a truly multifunctional peripheral—with a few quirks.

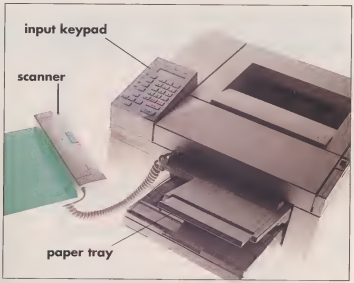
The heart of the unit is the LED printer that supports PCL 5 emulation and—surprisingly for Okidata—TrueImage, Microsoft's PostScript clone. The print engine is rated at 8 pages per minute, but we found that it printed much more slowly in our tests on a 486/33 system—5.6 ppm for PCL emulation and 6.6 ppm for PostScript emulation. The Doc.It printer is a dumb printer—that is, documents are rasterized on the Doc.It controller in the computer instead of in the printer. And since image processing occurs inside the computer, a faster processor means faster printing.

In addition to the image processor, the Doc.It controller also includes a 9,600-bit-per-second fax/modem. It supports all types of faxing—you can send and receive documents as either hard copy or as electronic faxes. (Other printers with built-in fax capabilities, such as NEC's Silentwriter Model 95, allow you only to fax electronic files and then print out all received faxes.) Additionally, the printer's Windows-based software—Doc.It Manager—logs both incoming and outgoing faxes and handles fax scheduling.

The scan head built into the printer for faxes does duty as both a copier and as a 400-dot-per-inch scanner that produces 64 levels of gray. You can scan text or images into Doc.It Manager and store them as either TIFF or Group 3 documents or paste them into other Windows applications. You can also use the scanner as a fax machine; simply select the fax button and enter the fax number on the keypad.

Doc.It 4000's system requirements are pretty high. Okidata recommends a 386 with 4MB of RAM, 10MB of free hard disk space, 400K of available lower memory, and a free 16-bit slot. Setting up the Doc.It is straightforward, though be sure to check the README file, which gives instructions for inserting a statement into your Windows SYSTEM.INI file to prevent Program Manager from crashing. Okidata claims the Doc.It installation program will automatically update SYSTEM.INI in a future version.

The biggest disappointment about the Doc.It 4000, however, is its price. While the machine's integrated design saves space, the $4,999 list price doesn't offer any incentive for purchasing Doc.It instead of the separate components. For the same amount of money, in fact, you can pick up a first-rate printer, a top-of-the-line scanner, a 9,600-bps fax/modem, and first-class fax software—and still have enough left over to buy a desk to put them on. CYNDY BATES



Okidoto's multifunctionol Doc.It 4000 serves os on LED printer, o 9,600-bps send-ond-receive ploin-poper fox/modem, o convenience copier, ond o 400-dpi sconner thot produces 64 levels of groy. Not shown ore the controller boord for the computer ond the Doc.It Monoger software.

FONT PACK 2: THE SEQUEL

Still don't hove enough TrueType fonts? Microsoft (800-426-9400) now offers o sequel to its originol font pockoge with the TrueType Font Pock 2. The $69.95 collection of fonts incloes 44 heodline, decorotive, symbol, ond text fonts for dressing up ony Windows document. And just in cose the thought of 44 more fonts overwhelms you, Font Pock 2 olso includes Font Assistont, o font monoger thot mokes it eosy to sort, orgonize, ond group fonts.

Font Assistont disploys fonts os they would opperr in your document, which ollows you to preview fonts before instolling them. You con olso define groups of fonts ond ossign them to porticulor opplications, or print summories ond somples of grouped fonts.

One drowbock: Font Assistont supports only TrueType fonts. If you olso use PostScript fonts, you'll wont to try the $79.95 FontMinder from Ares Softwore (800-783-2737), which offers most of the some feotures ond olso hondles Type 1 fonts. CYNDY BATES

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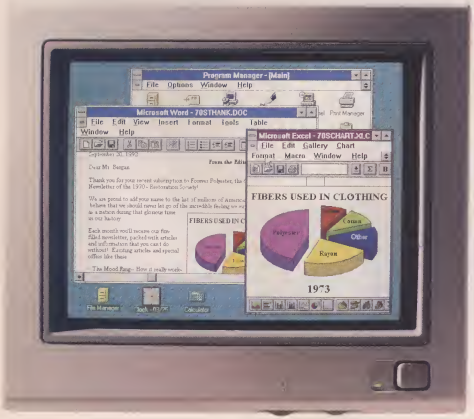

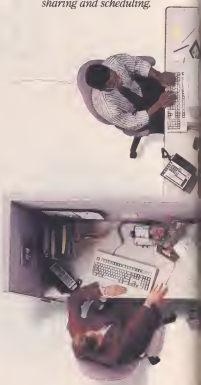

If you're a developer, you can get a copy of the Win32 Preliminary SDK for Windows NT by calling Microsoft Developer Services at (800) 227-4679. © 1992 Microsoft Corporation. All rights reserved. Printed in the USA. Inside the 50 United States...

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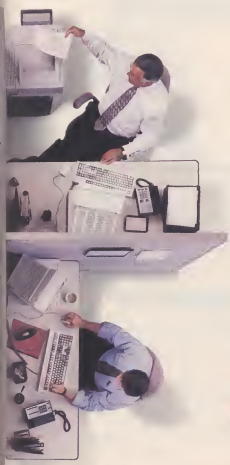

MICROSOFT WINDOWS NT 3.1

It's a fully 32-bit, scalable, multitasking Windows operating system with built-in networking capabilities and advanced security. It will be available to end users in early 1993.

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The file manager toolbar lets you use your network as fast as you can point and click. It gives you access to commonly used functions, such as sharing files and sending documents, at the touch of a button. How could sharing information be any easier?

For starters, you can say goodbye to the old "mind if I borrow your disk" routine. With Windows for Workgroups, you'll be able to share files and applications, even printers, faster than you can say "eject."

And then there's this handy little feature called Schedule+.

Say you want a meeting on Tuesday with Matt, who has a meeting with Duncan and Karen, who, wouldn't you know it, are meeting with Jim that same day.

No problem.

Just a couple of clicks and, zip, everyone's schedules are laid out right in front of you. So you can book a meeting without making a jillion phone calls.

Even things as basic as sending memos are simplified with Microsoft Windows for Workgroups. Now you can send electronic mail, including voice and graphics, to anyone in your workgroup.

In other words, Windows for Workgroups lets you share something with your coworkers other than frustration.

But just because it has these advanced capabilities doesn't mean that you'll need an advanced degree to understand it.

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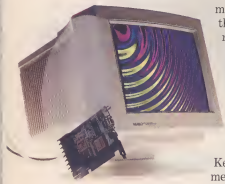
A DYNAMIC GRAPHICS DUO

A monitor is only as good as the graphics card that drives it. That's what makes Nanao's (800-800-5202, 310-325-5202) monitor/video card bundle a great deal. For $999, you get Nanao's new 15-inch FlexScan F340iW high-resolution monitor and a speedy Windows accelerator based an ATI's Mach 32 chip.

The monitor handles resolutions of up to 1,024 by 768 pixels with a 76Hz flicker-free refresh rate. A flat-square tube minimizes glare and produces ultrasharp images, and digital controls let you fine-tune images and colors. Nanao also sells the FlexScan F340iW separately for $899.

WENDY TAYLOR



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(408) 395-7000

CAERE CORPORATION'S PageKeeper is one of the coolest software programs you'll ever see. It's a tough product to categorize, but it essentially does a great job of combining document-management, text-retrieval, optical character recognition, and image-management features. In a networked office or on your crowded hard disk, this product's ability to prioritize and search for documents according to relevancy will turn heads.

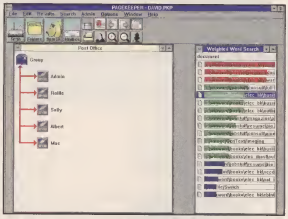
PageKeeper can manage documents and images in many file formats, and it imports information into an internal database. Caere's award-winning OmniPage OCR engine is built in, so PageKeeper can easily integrate paper documents—such as memos or press releases—into its global database of documents. It can also manage enterprise-wide e-mail, although not as elegantly as it should. What's the bottom line? If you remember a particular communiqué as being very important but you don't remember whether it was an electronic WordPerfect document, a paper memo, or e-mail, PageKeeper will find it in no time.

Relevant Documents Only

PageKeeper searches through the mountain of information in its database with a preternaturally intelligent retrieval engine. Ask PageKeeper to retrieve something, and it gives you a list of documents ranked by relevance. The most relevant documents are at the top of the list and are color-coded in red. Less relevant documents are coded in green, and those deemed least relevant are in blue. Simply double-click on any item on the list to view the retrieved document.

Unlike most text-retrieval products, PageKeeper determines relevance without input from the user. Caere doesn't explain the technology behind this capability but does say that PageKeeper analyzes the syntax of each document to figure out its importance. In our tests with several sample databases, the documents at the top of the list were almost invariably the most important. This level of software intelligence is eerie at first, but it works. Even when it failed, search results were no worse than those produced by other, less ambitious text-retrieval products, which often provide a huge list of retrieved documents with no clue as to which are important.

PageKeeper also uses this intelligence for what Caere calls "document agent searches." Documents that contain particular information—such as *sales* within five words of *forecast*—can serve as *agents*, or templates on which to base more searches. An agent search results in a flowchart that, based on relevance, lists the documents found by the search.



PageKeeper locates elusive documents and includes e-mail. The program lists documents that match search criteria and color codes the most relevant ones in red.

PageKeeper makes good use of Windows to ensure ease of use. For example, PageKeeper users can place related information in folders, and filling folders is as simple as dragging items from a list of search results and dropping them on a specific folder. A customizable icon bar makes short work of most other critical functions.

No Editing on the Fly

PageKeeper supports work-group activities with a basic e-mail system that allows group members to exchange messages and files. Work-group members also can annotate information with notes attached to documents. As a true work-group (*continued on page 68*)

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2nd Notice

Your account is now 60 days **PAST DUE.** We hope you are paying more attention to your guppies than you are to us. Remit your payment to avoid further action.

Please pay your bill so we can pay our bills.

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Your account is now ***Seriously Delinquent.*** If you do not pay the total amount due by Friday midnight, your guppies will be repossessed, your credit damaged and your fishing license revoked.

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BOB'S Tropical Fish GRUBS

Thank You

We appreciate your prompt payment. As always, we value your patronage and we look forward to seeing you soon.

P.S. By now, you've discovered the phenomenal rate at which a Tahitian Swayback Guppy grows. Coincidentally, for a limited time, our 100-gallon aquariums are now on sale.

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TOUCHMATE'S COOL BUT COSTLY

Get in touch with your work: TouchMote from Visoge (508-620-7100) turns ony PC disploy into o touch-sensitive input device. It lets you control informotion onscreen by topping with your finger.

Unlike mony other touch-screen technologies, TouchMote is o cinch to instoll. Set the slim rectongulor box under your display, plug it into o serial port, load the Windows driver, ond your monitor now responds to touch under Windows. Sensors in TouchMote register the location ond pressure of your finger. Instead of using o mouse or trockboll, resize or move windows by touching ond pulling the edges, or select icons by topping on the screen.

Don't toss your mouse yet, however. TouchMote lists for o whopping $895—much more thon your overoge PC rodent.

WENDY TAYLOR

PAGEKEEPER, *from page 66*
tool, however, the product suffers from one significant shortcoming: While documents can be viewed, they can't be edited on the fly. The prerelease version we tested lacked both an editor for internally stored documents and the ability to launch documents created by other programs.

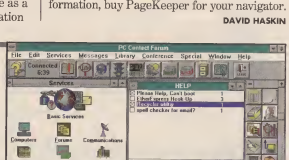
Caere says the latter capability will be in PageKeeper's final release, but editing internal documents will have to wait until the next version. With its limited ability to alter information, PageKeeper is more appropriate as a reference tool than for collaborative creation of information by work groups. And the program is missing another feature as well: Users can't modify the importance of words in documents to improve the accuracy of relevancy searches.

Sometimes, new technology is more interesting than useful. PageKeeper, however, is both: Its ability to manage databases of documents from many sources and its powerful text-retrieval capabilities create unprecedented mastery over documents. If your workplace generates a disorganized sea of text-based information, buy PageKeeper for your navigator.

DAVID HASKIN

WinCIM Brings CompuServe to Windows

THERE'S GREAT NEWS for CompuServe junkies: You no longer have to forego Windows when you log on. CompuServe Information Manager for Windows—aka WinCIM—is a new front end to its online service and ZiffNet (home of PC/Contact) that lets you navigate CompuServe via a Windows interface—and cut your online time and costs. Though it's far from perfect, WinCIM brings a much friendlier face to the venerable online service.



CompuServe Informotion Monoger for Windows puts o Windows interfoce onto CompuServe. WinCIM lets you click on icons representing forums ond services, os seen here.

CompuServe and ZiffNet users will find WinCIM helpful in moving through the often bewildering array of online commands and choices. Reading and writing forum messages, finding and downloading software, accessing databases, and using e-mail is much easier—and faster—with WinCIM. You no longer have to remember complex commands and confusing online locations; just click on icons or use pull-down menus.

WinCIM helps you do as much as possible offline—while the CompuServe meter isn't running. Use it to log on automatically and download your e-mail so you can read and answer it offline, or browse message descriptions in forums online, then mark and capture those you find interesting.

People who like to download will especially welcome WinCIM, which lets you mark files that you want, then download them all at once. During longer downloads, you can minimize WinCIM and receive files in the background.

A few things do need improvement. WinCIM automates access to parts of CompuServe and ZiffNet, but it doesn't go far enough. The popular DOS-based TAPCIS and OzCIS front-end programs are better at automating access to forum messages.

WinCIM is available for a song. Download it from CompuServe (type GO ORDER when you're online) for a small fee—$10 when we went to press—and you get an equivalent usage credit in return. You can also order it with documentation for $25, which includes a $25 online credit. Since the product is essentially free, all Windows and CompuServe users, no matter their level of expertise, should give it a test spin.

PRESTON GRALLA

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STEVE BRODY, PRESIDENT—BRODY & ASSOCIATES

FINANCIAL TIMES REPORT

Friday, January 15, 1993

Projections indicate strong economic growth

Stocks rally, bonds fall, as GNP, CPI, and jobless rates show better than expected rise in long term growth and inflation.

Many money managers are looking at stocks, and what they see is a strong economy with low inflation and low interest rates. Consumer confidence is strong, overall the National Economic Council is reporting.

With confidence in the European currency markets, the Federal Reserve Board has been able to lower interest rates to the lowest possible, encouraging or enabling the economy to run faster and increase good money spending, the reserve board has lowered the discount rate, a key interest rate, twice in the past two years.

A number of financial experts indicate that the performance of the economy, and the stock market, will be good for investors with long time views. Also major stocks, a bond index, and a bargain list for the new first-number. The average rose by 7.12% to 3,301.11 in the last month.

Little spending months of new money managers, increased stocks: only one may be so or doubtful but is showing signs of improvement.

Many financial experts believe stocks are the best place to invest long-range for further time yet. Consumers are likely to step up their purchases and the year ended large sums. But the Dow Jones 30 Index, only 30 stocks, is up, especially of consumer goods companies and companies serving their business and their family.

Lower interest rates predicted

Treasury bills have been at lowest levels in decades, and long-term interest rates are at lowest levels in years.

Bargains among closed-end funds have become even more attractive as the discount from net asset value has grown to record highs in recent weeks and the underlying gains mount up in value. Closed-end funds have a fixed number of shares outstanding, unlike mutual funds, and trade on the stock exchanges and their value is based on the value of the fund's underlying portfolio, which, if fund does well, starts to produce value to the shares of it, generally, while non-selling funds is a discount.

In the first quarter of the year, the average discount among domestic closed-end stocks narrowed to 7.5 percent, from a peak of 11.7%. Through June 23, the average discount widened to 12.1%, according to data on the fund analyst, Lipper, as some sold the stock market.

Lowest-priced municipal bond funds had the average wide discount, 14.1%, while international equity funds averaged only 1.1%. In a year-ago survey, Lipper, a leading closed-end fund, sold at an average premium of 2.7%, with uniform equity funds sold at an average premium of 1.8%.

Leading Indicators by Region

Region	Index	Change	Regional
Northeast	250.1	+1.12%	+12.67%
South	250.4	+1.09	+12.5
West	236.8	+1.09	+12
Northwest	141.2	+1.54	+1.75
Southwest	198.4	+1.54	+1.60

Economic picture a mix of ups and downs

Overall, economic data is mixed. Most are good and they are improving, but some are not. Consumer confidence and spending may wear on the other.

The Dow Jones 30 Index, the 30 prominent stocks, the most stocks which appear above or dropped out of the month's 30, increased a year or more ago or the stock's rising up to 1, 2, 3 months or longer. 7.12% gain, the most stocks rising 19.18% the month's 30 by appearing up or coming up. Companies. Even the Dow Jones 30 Index, the 30 prominent stocks, the most stocks which appear above or dropped out of the month's 30, increased a year or more ago or the stock's rising up to 1, 2, 3 months or longer. 7.12% gain, the most stocks rising 19.18% the month's 30 by appearing up or coming up. Companies. Even the Dow Jones 30 Index, the 30 prominent stocks, the most stocks which appear above or dropped out of the month's 30, increased a year or more ago or the stock's rising up to 1, 2, 3 months or longer. 7.12% gain, the most stocks rising 19.18% the month's 30 by appearing up or coming up. Companies. Even

Meanwhile, in the bond corporating top-rated bonds rallied 1 point, to 101 1/2, and the yield on 30-year Treasury bonds fell to 7.29%, the lowest yield since 1971. It's a sign of the bond decline in the past four months.

With a push of a button, a PC, and a scanner, TypeReader recognizes any document—retaining columns, font styles of various sizes for maximum productivity.

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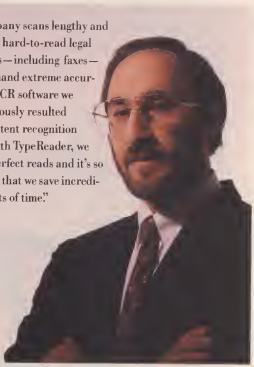
"Our company scans lengthy and sometimes hard-to-read legal documents—including faxes—which demand extreme accuracy. The OCR software we used previously resulted in inconsistent recognition quality. With TypeReader, we get near perfect reads and it's so easy to use that we save incredible amounts of time."



NEIL ARESTY, PARTNER—LEGAL COMPUTER SOLUTIONS

TypeReader isn't just an extraordinary OCR product. It's an extraordinary OCR tool that helps managers, owners and professionals get their work done faster. With better results than they ever thought possible. These OCR users and many others became believers when presented with the opportunity to compare leading OCR software (including OmniPage® Professional) to TypeReader software from ExperVision.

Their words speak for themselves, so we won't burden you with a lot of sales hype. We'll simply tell you that by acting now, you'll pay only $149 for TypeReader with proof of ownership of another OCR software product.* If you're not a current OCR software user, you'll get a $100 rebate when you purchase TypeReader.

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EXPERVISION

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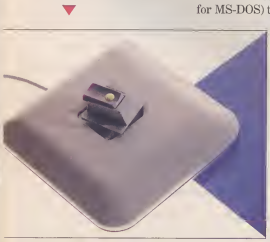
The Print Shop Deluxe Is a Hit For Font and Graphics Lovers

FELIX CHASES MICE AWAY

Mouse alternatives are generally dumsy solutions. For once, though, there's one we can really endorse. Felix for Windows from Altro (307-328-1342) takes up less room on your desk than a mouse pad.

Like a trackball, the $118 Felix remains stationary while you manipulate a floating handle. The handle's position mimics the cursor position onscreen. The most you'll ever have to move Felix is an inch and a half, even to travel across the screen.

An onboard processor aids Felix in calculating screen position, so it requires its own power supply. Altro includes an AC adapter, as well as drivers for DOS and Windows. CYNDY BATES



THE PRINT SHOP DELUXE FOR WINDOWS, $79.95
BRODERBUND SOFTWARE
P.O. BOX 6125
NOVATO, CA 94948
(800) 521-6263

ANOTHER DOS SOFTware superstar has finally made the leap to Windows. Broderbund's Print Shop Deluxe for Windows, a step up from the company's perennial best-seller for DOS, requires Windows 3.1 and the higher memory requirements of a Windows-compatible PC, but it also offers two benefits not found in the DOS version: 30 scalable TrueType fonts—which also become available to all your other Windows applications—and the ability to import nonproprietary art in Windows' BMP format.

The Print Shop Deluxe lets design novices create signs, greeting cards, calendars, banners, and letterheads. A variety of layouts are suggested, and you fill in the boxes with text or graphics. Some 300 pieces of clip art are included, and because they are object oriented, you can scale and resize them without producing the jaggies.

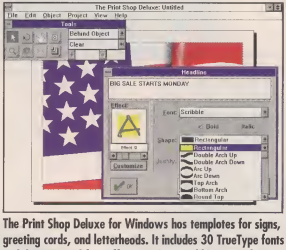
You'll need at least 4.8MB of hard disk space to install The Print Shop Deluxe for Windows. You can get by with 2MB of memory, but Broderbund recommends at least 4MB.

When you install The Print Shop Deluxe for Windows, another icon in its program group represents a graphics export utility. This is actually a DOS utility (the same one that comes with The Print Shop Deluxe for MS-DOS) that allows you to export Print Shop Deluxe graphics to any of five formats: EPS; EPS with Preview, CGM, or TIFF; and PCX.

Though the program doesn't offer the flexibility of Broderbund's TypeStyler for the Macintosh, a score of canned text effects lets you change the shape of type so that, for instance, the text appears to be squeezed in the middle, arching up, or receding into the background. And text and graphics can be rotated.

Most of the 30 outline fonts, including Bazooka, Scribble, Stagecoach, Standout, and Stylus, are different enough from the standard TrueType fonts that come with Windows 3.1 that they provide great variety—particularly for display type. The same group of fonts, incidentally, comes with The Print Shop Deluxe for MS-DOS.

You can control how dark particular Print Shop Deluxe graphics elements print, which is particularly useful if you overlap art or create effects like water marks. If you want to adjust the darkness of a BMP image, however, you must do so in another program before importing it into Print Shop.



The Print Shop Deluxe for Windows has templates for signs, greeting cards, and letterheads. It includes 30 TrueType fonts and does unusual font effects, such as scribble, seen above.

The New Print Shop will still be available, but there is no upgrade for either Print Shop Deluxe version. Broderbund is also selling two accessory packs, Sampler Collection and Business Collection, for $44.95 each. Each includes 125 new graphics and 12 fonts, and each is available separately for Windows and DOS.

The Print Shop Deluxe for Windows is useful for graphics designers in small- and medium-size businesses. Even if you don't use the graphics, the fonts are worth the price. The new interface holds few surprises for anyone accustomed to Windows, and we found it extremely intuitive. At $79.95, the program is a knockout value just for its 30 TrueType faces.

MICHAEL ANTONOFF

HELLO

Glad you could stop and look at our ad. Reading this magazine is confusing, isn't it? Every PC ad says the same thing these days. Who can you believe? Believe in yourself. You're smart. Strip away all the hype and you'll know a good buy when you see one. You want a great computer at a great price – from a solid company that'll take care of you. At Gateway, that's what we offer. Take a look at our products and services – then give us a call. Simple!

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The Big Guns Unveil Powerful And Cheap Windows Notebooks

A TEXT-SMART WINWORD GUIDE

Misplacing a document is easy—finding it again is the hard part. Word for Windows users can enlist the help of the $69 AutoIndex from readware (800-726-2049), a document-indexing and text-search utility.

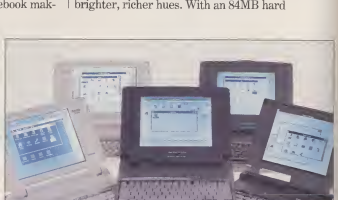
Unlike some other text-retrieval utilities that search files for keywords, AutoIndex uses its own filing system. Save a WinWord document, and AutoIndex prompts you for a description of the document, scans it for keywords, then stashes it in a filing cabinet with related documents. To find a file, enter a keyword and AutoIndex quickly searches the filing cabinet you specify. WENDY TAYLOR

FOR THE MILLIONS of business users now taking Windows on the road, a new breed of machine is beginning to emerge. Aimed at sophisticated but budget-conscious users, these new low-cost portables from leading notebook makers skimp on design niceties in favor of raw power.

We tested five 25MHz 386 machines from Compaq, Dell, and Toshiba, including two color models. All cost less than $3,000; monochrome versions cost around $2,100. Each model offers a well-constructed, Windows-capable PC in an under-8-pound package. Each has a perfectly adequate, if uninspired, ergonomic design. The chief drawbacks are poor display quality, heft, and in some cases, limited battery life.

Compaq's Contura now comes in both monochrome and color versions and is powered by either a 20MHz (monochrome only) or 25MHz 386SL CPU. Despite their bulk (11.7 by 8.9 by 1.9 inches, the color model is slightly thicker) and heft (6.9 pounds color, 6.4 pounds monochrome), the Conturas offer one of the best keyboard layouts we've seen. Slightly undersize function keys allow for independent Page Up, Page Down, Home, and End keys along the top. Cursor controls are below the right Shift key. Keys have a short, stiff throw that you'll either love or hate.

The Conturas outperformed the other systems in processing, memory, and disk chores, thanks to a 64K cache, but the Toshiba's color Satellite nosed ahead of them in video performance. The Contura 3/25c features a 9-inch diagonal passive-matrix color display capable of 16 colors at 640-by-480 resolution. Despite its relatively quick refresh rate, the screen disappointed us, with dark, washed-out colors. The passive-matrix color display on the Toshiba Satellite offers a bigger display area (9.5 inches diagonally) and brighter, richer hues. With an 84MB hard drive and 4MB of RAM, the 3/25c costs $2,799.

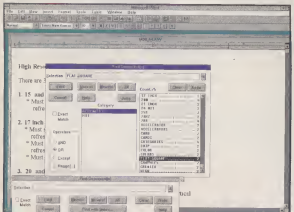


Five new 386/25 notebooks offer Windows processing power at affordable prices. They are, from left to right, the monochrome Toshiba Satellite T1850, the color Satellite T1850C, the color Compaq Contura 3/25C, the monochrome Contura 3/25, and the monochrome Dell NL25.

The monochrome 3/25, which costs $2,099, has a full 9.5-inch display, with bright colors and good—though not exceptional—contrast. Compaq outfits both Conturas with the same excellent power-management and battery-gauge utilities you'll find on the LTE/Lite. In fact, the 3/25 would be our favorite of the monochrome notebooks reviewed here were it not for its 2 hour and 19 minute battery life with power management features turned off. The monochrome Toshiba's battery lasted 3 hours and 31 minutes, and the Dell provided an hour more of battery charge than the 3/25.

The Dell NL25 weighs less than the other notebooks here—6.3 pounds—and has a more traditional form factor—8.5 by 11 by 1.8 inches. It features a bright, high-contrast 9.5-inch monochrome display. Keys are somewhat cramped, though function keys are larger than usual, and there are independent page keys.

The Dell's downfall is performance—especially video performance. Despite its 64K cache, the NL25 (*continued on page 84*)



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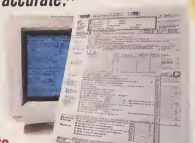

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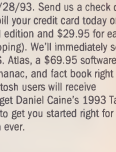

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POWER UP'S EASY CALENDAR

Despite same creativity, all personal information managers use the same basic metaphor—the calendar. The $79.95 Calendar Creator Plus for Windows from Power Up Software (800-851-2917, 415-345-5900) focuses on little else.

Calendar Creator Plus takes full advantage of the Windows environment, making it easy to select a month, make type bold, or impart a graphic. You can impart data from a host of formats, place bit-mapped images on calendars, and schedule individual or repeating events. The program supports multiple appointment lists and can merge them into one master calendar.

Printing support is first-rate: You can highlight parts of a calendar in color, print duplex, and print out InstaBooks, which are preset formats that you fold into portable booklets.

Calendar Creator Plus doesn't allow as much flexibility as we'd like, however. You can't manipulate some elements of the calendar layouts, for example. But if simple calendaring and slick output are all you want, forget the other, more expensive PIMs.

JON PEPPER

SL NOTEBOOKS, *from page 82*

dillydallied in processor, memory, and disk tests and fell on its face in Windows-intensive tests. Much of this can be attributed to the Dell's Cirrus Logic GD610/620 video chip set, which runs far behind fast Western Digital chip sets. We were also disappointed that the machine comes with only 2MB of RAM, expandable to only 8MB. Still, the $2,049 NL25 (with an 84MB hard drive, DOS, Windows, and a mouse) delivers long battery life in a lightweight package.

Toshiba's Satellite T1850C is a color notebook powered by a 25MHz 386SX. The machine's display is large, bright, and fast, which is critical to passive-matrix technology, especially when you're running Windows. In fact, the T1850C has one of the most pleasing passive-matrix color displays we've seen. Overall performance is respectable, too.

Both the color Satellite and the monochrome version—the T1850—come with the same keyboard layout as Toshiba's higher end notebooks. Key spacing and travel are excellent. The color T1850C measures 8.4 by 11.8 by 2.3 inches and weighs 7.3 pounds, while the monochrome T1850 measures 8.4 by 11.8 by 2.2 inches and weighs 6.9 pounds. Despite the T1850C's heft, it eked out only 2 hours and 6 minutes of battery life—the machine's greatest shortcoming. The lighter monochrome T1850, with its long battery life, quick performance, excellent keyboard, and bright display, is the clear winner of these five models. **MARTY JEROME**

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HP's DeskJet 550C Prints Faster and Produces True Black

THE DESKJET 500C wasn't broken, but Hewlett-Packard fixed it anyway. The new DeskJet 550C gives you the same low-cost, plain-paper color printing as the original, only better.

The original color DeskJet made you choose between color and black-and-white printing. If you were printing with the color cartridge, the 500C created black by mixing cyan, magenta, and yellow. The result, composite black, looked more brown than black. The 550C, however, uses two ink cartridges simultaneously—one is CMY and the other is black. The dual-cartridge printhead lays down color first, then black.

The DeskJet 550C is also much faster than the 500C. A 98K color image that the original printed in 4 minutes and 2 seconds printed in only 3 minutes and 41 seconds on the DeskJet 550C. And the more black your color images have in them, the more dramatically print times will drop. The DeskJet 550C printed our sample image with extra black 1 minute and 44 seconds faster than its predecessor and, surprisingly, 27 seconds faster than HP's high-end ink jet, the PaintJet XL300 (see New!, September 1992, page 66). The PaintJet XL300 does have a couple of advantages. Its print quality is much better, and because of its RISC processor, it will return control of the computer to you sooner. But it also costs $3,495, while the 550C costs $1,099.

HP's DeskJet 550C is an affordable plain-paper color printer, and it doesn't print composite blacks.

Other improvements include TrueType support and an adjustable paper tray that holds everything from envelopes to transparencies to legal-size paper. Overall, we're impressed.

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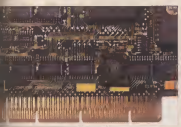

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SEBASTIAN RUPLEY

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INTEGRATED SOFTWARE lives. Works 3.0 for DOS is a fine-tuned version of Microsoft's popular integrated package, with important new features—such as an appointment calendar and a Windows-style toolbar—and a Windows-like look. Yet even with enhancements, Works is svelte enough to fit on a single 720K disk. It's great for portable use.

Works newcomers can now let Works-Wizards create address books, merge-print letters and labels, search for files, and perform database queries. The Wizards concept, familiar to Microsoft Publisher and Excel users, adds a new level of ease of use to Works' already excellent online help and tutorials. A Wizard is a series of automated steps that prompt you to make simple choices for executing a task.

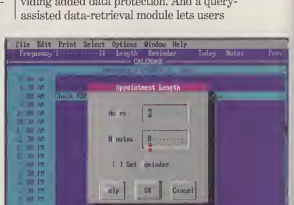
The Windows imprint is visible in other enhancements as well: Windows-style toolbars in all modules now make common functions accessible with a mouse click. And 3-D buttons and dialog boxes give Works for DOS a Windows-like visage.

Another Windows-like feature is dynamic data exchange–style linking that updates spreadsheet data in word processing documents whenever changes occur in the source worksheet. Footnotes and graphical images can now also be included in word processing documents.

The new calendar in Works 3.0 is impressive; it has a nifty array of scheduling features that includes free-time searching, daily notes, and reminders that chime within all Works modules.

The spreadsheet and database features have been expanded, with 75 built-in functions and operators, the ability to generate spreadsheets of up to 16,384 rows, and Excel-like Autosum addition of rows and columns initiated by clicking a toolbar item. Spreadsheet column widths can automatically accommodate data of varying lengths, and charts can be quickly created with the toolbar.

The Works database is now disk-based, providing added data protection. And a query-assisted data-retrieval module lets users locate information by responding to a series of prompts. Alternatively, Works can display information from the supplied database templates using predefined reports; users can also create their own reports with the help of a new report generator.



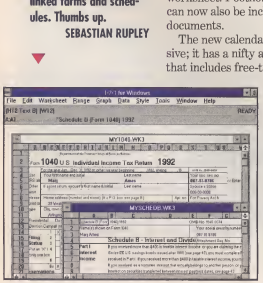
Microsoft Works 3.0 for DOS sparts an updated, graphical laak complete with Windows-like dialag baxes.

The communications package adds support for COM3 and COM4 serial ports and supports Xmodem, Ymodem, and Zmodem protocols.

How well does Works 3.0 integrate its various programs? While transferring information between modules is easily accomplished with Windows-like cut-and-paste operations, Works 3.0 still suffers from a wrongheaded Windows-style approach to file management. To open an existing document in any of the modules, you must choose from a list of DOS filenames rather than pick files from a list of descriptive titles. Moreover, Works makes you specify cryptic filename extensions (.WPS for word processor documents, for example) to narrow the file list to the module you're working in.

That said, this Works release demonstrates Microsoft's intention to prove that integrated DOS software has a future in an increasingly Windows-centric world.

GEORGE BEINHORN



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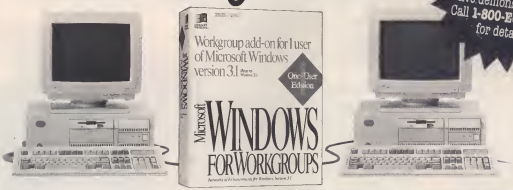

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Circle 198 on reader service card.

Spotlight

Fast Windows

The first Windows accelerators based on S3's new 86C801 chip are here. The following boards deliver ultrafast Windows performance at resolutions of 1,024 by 768 or higher for under $300. Look for VESA local-bus versions of NDI's and Genoa's boards to appear in systems shortly.

The $199 **GraphicsEngine 32** from Actix Systems comes with 1MB of memory, which allows for 256 colors and a 70Hz refresh rate at 1,024 by 768. It even revs up to 1,280-by-1,024 resolution, but only at a lower 60Hz refresh rate. The $299 2MB version of the GraphicsEngine handles as many as 65,536 colors (for near-photo-quality images) at 1,024-by-768 resolution. (Actix Systems; 800-927-5557, 408-986-1625)

National Design's $299 **Volante Warp 10** also handles 256 colors at 1,024 by 768 with a 70Hz refresh rate. While it doesn't support 1,280-by-1,024 resolution, it does have a connector for attaching multimedia capture devices. It also ships with several multimedia and imaging software utilities. (National Design; 800-253-8831, 512-329-5055)

Genoa Systems' $269 **WindowsVGA Plus** supports 1,024-by-768 resolution at a flicker-free 70Hz refresh rate. Genoa also includes high-resolution drivers for Windows and other programs, including AutoCAD, Lotus 1-2-3, and WordPerfect. The WindowsVGA Plus board is backed by a two-year warranty. (Genoa Systems; 800-934-3662, 408-432-9090)

THE LATEST UPGRADES TO PRODUCTS YOU USE

BY MARTY JEROME

Compaq ProSignia

Hot on the heels of its high-end Systempro line of servers, Compaq has introduced the midrange ProSignia servers aimed at small to medium-size businesses. Powered by either a 33MHz 486 or a 66MHz 486DX2, the ProSignias start in the mid-$2,000 range. (Compaq Computer Corp.; 800-345-1518, 713-370-0670)

Dell 466SE/DSA

Not coincidentally, Dell has also unveiled a new server, the 466SE/DSA, which features a SCSI-2 disk array that replaces the company's older IDE array. The system is based on Intel's 66MHz 486DX2. ($9,264; Dell Computer Corp.; 800-879-3355, 512-338-4400)

NewWave 4.1

Hewlett-Packard's latest release of NewWave picks up the pace. Version 4.1 is twice as fast as the previous version, according to HP, and provides better integration with DOS and Windows. ($195; Hewlett-Packard; 800-554-1305)

Harvard Graphics 3.05

Harvard Graphics is wired for improved sound. Version 3.05 of the best-selling DOS graphics package now provides voice annotation and music for onscreen presentations. ($595; Software Publishing Corp.; 408-988-7518)

Central Point Anti-Virus

Central Point Anti-Virus for DOS 1.4 ($129) also hunts down viruses on Windows-based PCs. Central Point Anti-Virus for NetWare, a new network version, costs $1,199 per server. (Central Point Software; 800-445-4208, 503-690-8090)

A Small—and Convenient—Modem
The convenience of credit-card-size PCMCIA modems is usually shortchanged by the external RJ-11 adapters you have to hook to them. Not so with Megahertz's Xjack, a 14,400-bit-per-second modem with a built-in adapter that pops up when needed and pushes in when you're done. ($699; Megahertz; 800-527-8677, 801-272-6000)

DaVinci eMail for Windows 2.02

DaVinci's new eMail for Windows Version 2.02 lets you view a mail attachment without exiting the application and includes a spell-checker and the ability to create file folders. Prices start at $799. (DaVinci Systems Corp.; 800-328-4624, 919-881-4320)

DataEase Express for Windows

Nonprogrammers should check out DataEase Express for Windows, the latest offering from DataEase International. A fully relational database that runs under Windows, the program costs only $395. (DataEase International; 800-243-5123, 203-374-8000)

WordPerfect's DataPerfect 2.3

WordPerfect has a new version of its relational database for nonprogrammers. DataPerfect 2.3 for DOS (a Windows version will follow) includes a new menuing system, a Quick Merge function, phone-dialing capabilities, and other features. ($495; WordPerfect Corp.; 800-451-5151, 801-225-5000)

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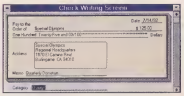

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Ad Code: PM1HQ

Short Takes

Fronklin Electronic Publishers' Digital Book System is pushing aggressively into the personal digital assistant arena. This 4.6-ounce, 16-bit computer lets you snap in wafer-size modules that hold up to 90MB of text. *The Physician's Desk Reference* will be one of the first modules available. ($199; Fronklin Electronic Publishers; 609-261-4800)

Medio Vision's Fusion CD and Fusion CD 16 let multimedia fire kickers upgrade their PCs cheaply. Both upgrade kits include the Pro AudioSpectrum sound card, a CD-ROM drive, and speakers. Fusion CD 16 uses the Pro AudioSpectrum 16 card. (Medio Vision; 800-348-7116, 510-770-8600)

Quantum's Hardcard EZ drives-on-a-card are available in new models: 42MB ($269), 85MB ($369), 127MB ($449), and 240MB ($749) versions. (Quantum Corp.; 800-624-5545, 408-894-4000)

Dauphin Technology's 5000 Color Pentop is the first pen-based PC with a color display. The 5000 Color Pentop is a 25MHz 386SL-based PC that uses a passive-matrix display capable of 256 colors at 640-by-480 resolution. ($3,995; Dauphin Technology; 800-782-7922, 708-627-4004)

AST Research's PCMCIA Data/Fax Modem, a credit-card-size 2,400-bps modem for AST's new line of notebooks, supports MNP5 and costs $279. (800-876-4278, 714-727-4141)

NEC Technologies' Ready Systems

Joining major systems makers that have introduced low-cost lines, NEC debuts its Ready line of 386- and 486-based systems that come bundled with PFS:WindowWorks, NEC Desktop by Peter Norton and AntiVirus, Prodigy, Windows, and Quicken. NEC is selling the Ready line through mass merchandisers, such as Lechmere and BrandsMart, for prices that start at under $1,199. (NEC Technologies; 800-388-8888, 508-264-8000)

Micrografx Windows OrgChart 2.0

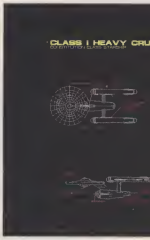
Micrografx is also entering the org-chart business with Windows OrgChart 2.0, an updated version of Roykore's Orgcharting product. The price has been lowered as well, to $149. (Micrografx; 800-733-3729, 214-234-1769)

Org Plus for Windows

The update to Banner Blue's best-selling organizational chart software offers full object linking and embedding support. ($199; Banner Blue Software; 510-794-6850)

Microsoft Publisher Design Pack and CD-ROM Edition

Microsoft is bolstering its low-end desktop publisher with Design Pack ($69.95), which includes 100 scalable clip-art images, and with CD-ROM Edition 1.0 ($199), which consists of three programs: Publisher, Design Pack, and Microsoft Draw. (Microsoft Corp.; 800-426-9400, 206-882-8080)



Beam It Onscreen

The latest screen saver from Berkeley Systems lets you hear the voices of Captain Kirk, Spock, and Bones. Star Trek: The Screen Saver costs $59.95. (Berkeley Systems; 510-540-5535)

Express Publisher 3.0

Power Up has rolled out an upgrade to Express Publisher, its DOS-based desktop publishing package. The new version automates layout functions such as selecting and matching typefaces and layout styles. ($149.95; Power Up Software; 800-851-2917, 415-345-5900)

PacificPage PE/XL 5.1

Pacific Data Products has released the latest in its family of PostScript-emulation products. The PacificPage PE/XL 5.1 incorporates printer-based automatic language sensing and switching, 4MB of memory, and improved network support. ($999; Pacific Data Products; 619-552-0880)

Animator Pro 1.3

Autodesk's leading animation package now comes with a CD-ROM that contains 364 animated clips, 100 PostScript fonts, 400 images, and 1,000 background titles. Animator Pro 1.3 also lets you create animated text charts. ($795; Autodesk; 800-879-4233, 415-332-2344)

Halo Desktop Imager 2.0

Media Cybernetics has upgraded its celebrated imaging utility, Halo Desktop Imager. Version 2.0 includes a new image-file-management interface, color-separation capabilities, and OLE support. ($169; Media Cybernetics; 800-992-4256, 301-495-3305)

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Robert D. Pinson, TV Production

Cynthia Krol, Westlake Village, CA

Timothy J McManus, Minneapolis, Minnesota

Susan Yeagley Sullivan San Diego, CA

Robert D Pinson, Miami, FL

These people are all real QuickBooks users. (Thanks for all your comments and photos!)

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New!

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The list price for the deal is $169, but expect lower prices in stores or through the mail. Call Dariana, maker of WinSleuth Gold and System Sleuth Professional, at (800) 892-9950 for details.

PCContact

Program Manager Utility at a Can't-Miss Price

Want to soup up Windows' Program Manager? Try the shareware program Plug-In for Program Manager. It adds a Browse capability to the Program Manager's Run command, allows you to better manage groups and change their icons, gives you Quick Run capabilities for launching programs without having to hunt for their icons, and lets you customize your cursor and the Windows' ever-present hourglass icon. (Our favorite substitute is a yawning man.) It also gives a complete rundown on your Windows' system resources and memory use. There's a lot more here as well; you'll find it's one of the best ways to power up Program Manager. It can be downloaded from PC/Contact, *PC/Computing*'s CompuServe forum, under the filename PLUGIN.ZIP in data library 3 (Utilities/Misc.). It can also be ordered for $20 directly from Plannet Crafters at (404) 740-9821.

Limited Time Offer: Great Deal on WordPerfect/Quattro Pro Combo

There's a great deal on WordPerfect for Windows and Quattro Pro for DOS or Windows (both versions of the spreadsheet come in one box). Until February 15, anyone who owns or buys a copy of MultiMate, Sprint, or Quattro Pro can purchase WordPerfect for Windows for $129. And anyone who owns or buys a copy of WordPerfect for Windows can buy Quattro Pro for DOS for $99.95. But wait—here's an even better deal: WordPerfect for Windows owners can buy both Quattro Pro for Windows and Quattro Pro 4.0 for DOS for $149.95. Call WordPerfect at (800) 321-5906 or Borland at (800) 331-0877 for details.

BEST SOFTWARE BUYS

Where can you get the best software deal? Usually through the mail. We surveyed mail-order houses and come up with the best prices we could find. The following prices include shipping and handling charges but not credit-card surcharges. Prices are as of press time and are subject to change.

PRODUCT	LIST PRICE	BEST PRICE	SOURCE
DOS 5.0 Upgrade	$99.95	$60.00	Software Add-Ons, (800) 695-8088
Excel 4.0	$495.00	$292.00	Software Unlimited, (800) 926-7638
Lotus 1-2-3 3.1 Plus	$595.00	$359.99	ET Valueline, (800) 395-1000
Microsoft Word 5.5	$450.00	$203.00	Software Unlimited, (800) 926-7638
Norton Utilities 6.01	$179.00	$110.00	Software Add-Ons, (800) 695-8088
QEMM-386	$99.95	$60.00	Software Add-Ons, (800) 695-8088
Quattro Pro 4.0	$495.00	$299.00	Software Add-Ons, (800) 695-8088
Windows 3.1	$149.00	$92.00	Software Add-Ons, (800) 695-8088; or Lomo, (800) 369-2846
Word for Windows 2.0	$495.00	$289.99	ET Valueline, (800) 395-1000
WordPerfect 5.1	$495.00	$255.00	Lomo, (800) 369-2846
WordPerfect for Windows	$495.00	$255.00	Lomo, (800) 369-2846

Get FrameMaker DTP Software for Half Price

FrameMaker, the innovative publishing software that's well known on the Macintosh, has made its way to the PC. And for a limited time, you can get the $795 Windows package for a low $395 if you upgrade to it from any Windows or Macintosh word processing, layout, or desktop publishing program. FrameMaker combines all of these functions in one program. The $395 also buys you a 90-day money-back guarantee, so you can return FrameMaker for any reason in that time for full refund. Call Frame Technology at (800) 843-7263 for details.

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*Results published in PC Week, PC Computing, PC Sources. Reprints available from Number Nine.

Circle 115 on reader service card.

Software Saleswire

Windows spreadsheets now easily outsell DOS versions, and Excel 4.0 from Microsoft (800-426-9400, 206-882-8080) sets the standard. Features that set it apart are its drag-and-drop metaphor for moving or copying ranges of cells, a shortcut menu that pops up when you click the right mouse button, and customizable toolbars for adding your own icons. There's also a new Workbook feature for grouping related worksheets and a Scenario Manager for creating alternative data ranges and saving changes with descriptive names. Microsoft has also incorporated Wizards that interactively lead you through tasks such as creating charts and reports.

Nov	Oct	
1	1	**WORDPERFECT 5.1 FOR DOS** (WordPerfect) The most popular word processor continues to hold its own against the onslaught of fancier Windows word processors. $495.
2	4	**EXCEL 4.0** (Microsoft) A powerful Windows spreadsheet with excellent database features and outstanding graphics. $495.
3	3	**PROCOMM PLUS 2.01** (Datastorm Technologies) This updated DOS communications program includes a companion text editor, password protection, and extensive file-transfer capabilities. $129.
4	2	**LOTUS 1-2-3** (Lotus Development) Better print quality and easier handling of large worksheets are recent improvements to this veteran spreadsheet. Release 2.4, $495; Release 3.1, $595.
5	6	**WORD FOR WINDOWS 2.0** (Microsoft) This flexible, sophisticated word processor includes a grammar checker, drawing tools, and excellent page-layout capabilities. $495.
6	-	**OFFICE FOR WINDOWS** (Microsoft) This software bundle from Microsoft includes the latest versions of four leading Windows business apps: Excel , Word, PowerPoint, and Mail for PC networks. $750.
7	-	**CORELDRAW 3.0** (Corel) Create professional charts and images for business presentations using the program's extensive drawing tools, clip-art library, and generous selection of fonts. $595.
8	-	**PARADOX 4.0** (Borland) A fast database for DOS users. Includes fully integrated presentation-graphics features, cross-tabulation, and a query-by-example interface. $795.
9	5	**PROCOMM PLUS FOR WINDOWS** (Datastorm Technologies) The Windows version of this communications program includes 34 terminal emulations and 10 file-transfer protocols. $179.
10	-	**WORDPERFECT 5.1 FOR WINDOWS** (WordPerfect) The Windows version of this word processor is file compatible with the DOS version, so you can exchange files easily. $495.

1	2	**WINDOWS 3.1** (Microsoft) Transform your PC into a graphical, multiapplication environment, and exchange text, numbers, and graphics easily between applications. $149.95.
2	1	**MS-DOS 5.0** (Microsoft) An upgrade to the standard PC operating system, this version includes better memory management, full mouse support, and a text editor. $99.95.
3	4	**QEMM-386** (Quarterdeck) Free more memory for your primary applications. Expands available memory by loading drivers, pop-up utilities, and DOS resources into high memory. $99.95.
4	5	**AFTER DARK** (Berkeley Systems) Give your Windows screen a break with flying toasters, fish, meteors, and other whimsical animated images. $49.95.
5	3	**STACKER 3.0** (Stac Electronics) Double your hard disk capacity. Stacker is compatible with everything from graphics programs to undelete utilities. Software only, $149; AT/16 upgrade, $116; MT/16 upgrade, $169.
6	9	**NORTON UTILITIES 6.0** (Symantec) An invaluable set of data-recovery utilities. Speed Disk increases performance by reducing access time while Disk Doctor diagnoses disk errors. $179.
7	-	**386MAX** (Qualitas) Expand memory from 640K to 1,024K by using this memory manager to load drivers, pop-up utilities, and DOS resources into high memory. $99.95.
8	-	**LANTASTIC/AI** (Artisoft) An adapter-independent version of the LANtastic peer-to-peer network operating system, Lantastic/AI runs networks of 2 to 300 PCs. $99 per node; 300-user license $2,499.
9	-	**FACELIFT 1.5 FOR WORDPERFECT** (Bitstream) Get 16 instantly scalable fonts that work with most dot matrix, ink jet, and laser printers. $99.
10	7	**OS/2 2.0** (IBM) A full-fledged 32-bit operating system. Look for low introductory prices. $139.

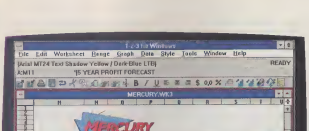
These software charts are compiled once each month by G. Meier, Inc., which gathers ranked-order sales information supplied by the following software industry sources. ABCO Distributors; American Software; Babbages; CompuAdd; CompUSA; Corporate Software, Dustin Discount Software, Electronic Arts Distribution; Ingram-Micro, Kenfil; Merisel, Micro Warehouse; Multiple Zones, PC Connection; Soft Kat, Software, Etc.; Software Plus; Software Resource; Software Spectrum; and Waldensoftware. A weighting system is applied to each entry based on three factors: the entry's position in the individual chart, the power of the contributing source based on annual gross sales, and the relative strength of a source in a given category of software. All prices are suggested retail and are subject to change.

Nov	Oct	
1	2	**QUICKEN 6.0 FOR DOS** (Intuit) This program organizes personal finances quickly and easily. Track accounts payable, accounts receivable, jobs, clients, and properties. $69.95.
2	1	**THE NEW PRINT SHOP** (Broderbund) Design your own letterhead, cards, signs, calendars, posters, and banners. Dozens of add-in modules are available for this DOS program. $39.95
3	10	**QUICKEN 2.0 FOR WINDOWS** (Intuit) The Windows version of the personal-finance program adds Windows advantages such as dynamic data exchange. $69.95.
4	3	**PRODIGY START-UP KIT** (Prodigy) A modem and this DOS-based software put you in touch with Prodigy's online service. A low monthly fee connects you to news, games, and stock quotes. $49.95.
5	-	**EXPERT HOME PACK** (Expert Software) This bundle of DOS programs allows you to design the floor plan and landscaping of a home or office. $29.95.
6	7	**DESIGN YOUR OWN RAILROAD** (Abracadata) Lay some track, create some scenery, and run some trains. It's the next best thing to a model railroad. $59.95.
7	-	**LOTUS 1-2-3 FOR HOME** (Lotus Development) A flexible and in-depth DOS-based spreadsheet helps computer users easily manage personal and household finances. $149.
8	-	**WALT DISNEY CHILDREN'S 5 AND UP BUNDLE** (Disney Software) Bundle of Beauty and the Beast Print Kit, Mickey's Memory Challenge, and Mickey's Crossword Puzzle Maker. $59.90.
9	-	**ANDREW TOBIAS' TAX CUT** (Meca) Tobias and his team guide you through your tax preparations, print IRS-approved forms, and flag a possible audit. $79.95.
10	4	**AUTOMAP/THE INTELLIGENT ROAD ATLAS** (AutoMap) Save time, money, and frustration. AutoMap supplies clear, detailed maps and driving instructions. $99.95.

1	2	**NEW MATH BLASTER PLUS** (Davidson) Four challenging activities cover addition, subtraction, multiplication, division, fractions, decimals, and percents while teaching math facts. $49.95.
2	1	**READER RABBIT 2** (The Learning Company) Children aged 5 through 8 will discover the sights, sounds, and meanings of words as they develop first- and second-grade reading skills. $59.95.
3	-	**SPACE ADVENTURE** (Knowledge Adventure) An adventure that provides a comprehensive look at human exploration of space, robotic space exploration, and the science of space discovery. $79.95.
4	-	**MATH MAGIC** (Mindplay) Children aged 4 through 8 will build math skills while fighting off monsters and answering questions. $59.99.
5	-	**EASY STREET** (Mindplay) Children aged 4 through 8 can take a shopping trip with this DOS program and learn how to follow directions, select items, and count money. $59.99.
6	-	**DYNO-QUEST** (Mindplay) Children aged 8 through 12 will test their memory and sharpen map-reading and tactical skills as they track down facts about dinosaurs.$59.99.
7	7	**WHERE IN THE USA IS CARMEN SANDIEGO?** (Broderbund) Carmen is stealing national treasures. Track her down and learn about the geography, economy, and history of the 50 states as you go. $49.95.
8	-	**TREASURE COVE** (The Learning Company) This underwater science adventure introduces children aged 5 through 9 to a variety of sea creatures while challenging their science and deductive-reasoning skills and enriching reading and math skills. $59.95.
9	-	**BODYWORKS** (Software Marketing) Study the central nervous system and parts of the brain, discover the inner workings of the heart, and observe the eye from many angles with this anatomy program for adults and children. $79.95.
10	-	**MAVIS BEACON TEACHES TYPING** (The Software Toolworks) Make typing fun by practicing on riddles, rhymes, and jokes. Lessons are geared toward the user's age and interests. $49.95.

Good news for designers: Broderbund's best-selling Print Shop for DOS has made its way to Windows. The Windows version includes 30 scalable TrueType fonts (alone worth the $79.95 price) and 100 clip-art images. You can also import bit-mapped images from other applications—a feature not available in the DOS version. Broderbund (800-521-6263, 415-382-4600) is also selling two accessory packs—Sampler Graphics Collection and Business Graphics Collection—for $44.95 each. Each includes 125 new graphics and 12 fonts.

Compared to Lo
Microsoft Office look



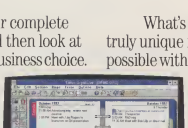
1-2-3 for Windows Release 1.1 now includes over 25 new features and usability enhancements.

Ami Pro 3.0 includes new features that make it more powerful and easier to use than Microsoft Word for Windows.

It's true. When you evaluate our complete solution for Windows™ desktops and then look at theirs, you'll see why ours is a better business choice.

Of course, both SmartSuite™ and Microsoft® Office include full-featured products. But SmartSuite has been recently updated to include 1-2-3® for Windows Release 1.1 with SmartPak™ and the newly released Ami Pro® 3.0, as well as Freelance Graphics® and cc:Mail.™

All four of these award-winning products share a common interface as well as our innovative SmartIcons.™ So when you've learned one, you've learned them all.



For a limited time, SmartSuite includes Lotus Organizer, the computerized way to keep tabs on all your daily tasks.

What's more, SmartSuite delivers some truly unique integration capabilities that aren't possible with Office. All four SmartSuite products, for example, share data, text and graphs between each application smoothly and seamlessly. So when an outline produced in Ami Pro is imported to Freelance Graphics, it's automatically converted into a Freelance Graphics outline and full-slide presentation. And a 1-2-3 graph exported to Freelance Graphics will arrive, fully editable. Not so with Excel and PowerPoint.® You can even move quickly between SmartSuite

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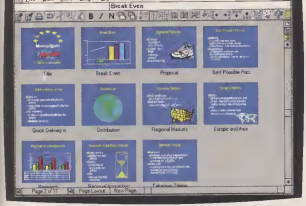

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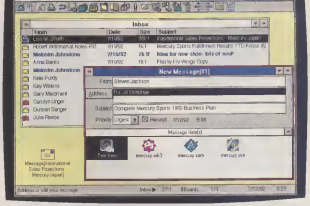

cc:Mail, the world's leading LAN-based e-mail system, allows you to send documents across all major networks and computing platforms.

applications just by clicking the icon of the application you want to open.

Better still, all SmartSuite applications are mail-enabled. So you can use cc:Mail to send "live" documents from within each application. Office, on the other hand, requires you to install and use an optional macro with Microsoft Mail 3.0.

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Lotus SmartSuite for Windows

1-2-3, Ami Pro, Freelance Graphics, and cc:Mail

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John C. Dvorak

Computer Commonplaces: Let's Debunk Their Misguided Logic

A SLEW OF COMMONPLACES—CUSTOMARY ASSUMPTIONS—permeates the computer business. Like any set of assumptions, only a few are analyzed and many are eventually taken for granted and then considered fact. Let's analyze a few commonplaces to see if we've fallen into their trap.

Computers will continue forever to get smaller, cheaper, and faster. Will this never be reversed? What if a shortage of a component that is derived from a nonrenewable resource develops? Remember the huge increase in the price of gold in the 1970s? Gold-plated connectors became too expensive and many card makers used silver! It's possible that some future chip technology will require rare minerals that will become costly and increase the price of the machine of the future.

The "computers will continually get smaller" aspect of this commonplace is also debatable. In fact, computers have been getting bigger and smaller at the same time, but mostly bigger. The large 19-inch monitor is what everyone wants. Is this going to get smaller? Small screens were the rage back when the PC scene began. A 9-inch monitor was considered big. IBM developed a desktop BASIC+APL computer in the mid-1970s with a 5-inch screen. Now, anything smaller than 14 inches is laughable. The boxes, too, have increased in size. The AT was decidedly bigger than the XT. Now everyone wants a huge tower machine.

On the other end of the scale are the laptops. It's taken years to get makers to seriously shrink machines to the size of the Gateway Handbook. A few 4-pounders appeared at Comdex this past autumn, but most people seem happy with a weight of 6½ pounds. That's neither light nor small as far as I'm concerned.

The keyboard will soon be history. This issue of commonplace assumptions came to mind after I read an article that declared today's desktop computer dead. I've heard this before. People have abandoned the clunky desktop computer for all sorts of fancy handheld devices, the pundits say. Above all, the archaic keyboard will be history by the year 2000. Or so the theory goes.

As usual, the pundits are making unwarranted assumptions.

I've been thinking about this keyboard thing for a couple of years, especially since it was challenged by the pen-based computer and will soon be challenged by voice recognition. It's easy enough to pooh-pooh those two technologies as unworkable and write them off as failures waiting to happen. But this argument in itself makes assumptions. It assumes the technologies will never work.

Try this instead: Argue the point with the assumption that both of those technologies will work perfectly in the future. Let's say that handwriting recognition works with 100 percent accuracy 100 percent of the time. Same goes for voice recognition. Now what does the world look like?

It doesn't look *any* different. People will still use keyboards as input devices.

Mark Twain was the first person to use a typewriter to submit a manuscript to a book publisher. More than a hundred years have passed, and society has adopted the keyboard as the preferred writing instrument. There are a few oddballs who never use one, but that's beside the point. The people who do use keyboards aren't going to abandon them. The fact that writers in Mark Twain's time began to abandon handwritten manuscripts in favor of typewritten manuscripts is the key observation here.

This period—around 1875—was the last time there was a battle for mind share (I hate the term, but it seems to apply) between the pen and the keyboard. Why did the keyboard win this battle? Because it was faster and easier than handwriting. This wasn't a neatness issue, either. It was a matter of convenience. When given the chance, users will always choose a keyboard even if they are hunt-and-peck typists.

Handwriting recognition, even if 100 percent accurate, will never be much more than a yawner, a novelty. Voice recognition won't be much different except as a niche product for inventory takers and insurance adjusters taking notes at three-car pileups. As a general office input device, it belongs right up there with touch screens.

Touch screens and audio input are better devices than the keyboard. Touch screens never found use in the office because they were also inconvenient. The HP-150 fiasco proved that. About seven years ago, HP brought out a touch-sensitive screen for the office. It was a bust for a number of reasons, not the least of which is that people don't like hunching forward to touch spots on a screen. Imagine a fly landing on the screen and resetting the system by wandering around and triggering buttons. The audio-input computer will be a little different, but not much. Can you imagine walking into an office full of computers with clerks chatting at the machines? I'd love to see a guy walk in and at the top of his lungs scream out: "ERASE HARD DISK!!" for all the machines to hear.

Nothing will replace the keyboard. In fact, I don't believe our basic model for desktop computing will change for decades. The model consists of the keyboard, a large monitor, and a computer in a box, with an ancillary laptop/notebook for portable use. All that will change is the power inside.

But then again, this concept of mine is a commonplace too, isn't it? ◩

PHOTOGRAPH BY RUTH KOMANOFF

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INTRODUCING A 1.3 LB. PC! SEND & RECEIVE E-MAIL AND MORE.

Imagine a portable PC that lets you send and receive e-mail, modem a memo to the home office, write reports, create spreadsheets, manage your calendar, calculate your expenses...*work non-stop for ten hours*...and is so portable that it weighs about the same as a notepad.

A futuristic fantasy? Not unless the future is now. Its the ZEOS® Pocket PC, and only ZEOS has it. You're going to love how portable and affordable it is. In fact, we think you'll find it's the one PC you'll want to take with you everywhere!

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At only 9⅛" x 4½" and only 1.3 lbs., what's great about the ZEOS Pocket PC is that it has a keyboard you can really use. If you're accustomed to typing with both hands, switching to a palmtop can be awkward because the keyboard only lets you type with one hand or even one finger. Yet the ZEOS Pocket PC's keyboard lets you use both hands easily, so you won't sacrifice comfort and speed for portability.

And even though it's small, the ZEOS Pocket PC carries a *full suite of industry standard software* already loaded and ready to go! You get Microsoft DOS 5.0 system files with built-in file transfer and Microsoft Works 2.0 with word processing, spreadsheet, database and communications programs. Plus, you get a personal organizer which includes a calendar/planner, "to do" list, business card file, information retrieval (for country codes, converting measurements and currency) and more. It's everything you need to manage your life!

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ZEOS INTERNATIONAL, LTD.

John Dickinson

MicroKernel: IBM's Seed of Hope For Succeeding in the PC Market

IBM'S OPERATING-SYSTEMS PERFORMANCE DURING THE past couple of years has made Big Blue look more like the gang that couldn't shoot straight than the world's largest computer company. First, it developed OS/2 in partnership with Microsoft, for which Microsoft took much of the credit. Then IBM shipped a clearly incapacitated version of OS/2, which Microsoft first disavowed and then abandoned to embrace Windows. Disenfranchised by Microsoft, IBM continued to promote the original version of OS/2 while developing a new release called Version 2.0 and shipping Windows with some of its PS/2s.

As if that weren't confusing enough, IBM embraced Apple in a joint venture to design the "next generation of personal computers." The resulting Taligent partnership was chartered to develop the PowerPC RISC microprocessor, which is incompatible with the PC-standard Intel *x*86 architecture, and to develop an optimized object-oriented operating system for it, which is not intended to be compatible with OS/2, Windows, or anything else on the face of the planet. Somewhere along the way, IBM also formed a relationship with Next to do something—I'm no longer sure what.

All the confusion was a plot hatched, not by Microsoft, but by inept IBM marketing folks who seemed determined to keep you from the truth about how all this fits together. Recently some smart people regained control of communications at IBM and let me in on Big Blue's strategy—so now I can tell you.

Here's the Big News

The biggest secret of all is that the pieces of IBM's seemingly impossible operating-systems puzzle fit snugly together. The company has a clear and powerful strategic design based firmly on a newfound understanding that the future of desktop computing depends on the operating systems that drive it. DOS, OS/2, Taligent's advanced object-oriented operating system, IBM's AIX Unix system, and even Windows can all fit together in this brave new world and can run concurrently or separately on the PowerPC, Intel *x*86 processors, and other RISC processors. How the pieces fit together is a model of an operating-systems architecture that supports complex environments with simplicity and elegance.

Big Blue's vision of an object-oriented OS may be realized in 1993

Operating systems are really just programs that provide environmental services commonly needed by all software. Modern systems are flexible and granular, and the newest technology is called *object-oriented design*, which means that system components are developed as objects that combine data and code. A core program, called a *kernel*, manages the use of objects and takes care of basic tasks, such as memory management. The capabilities of that kernel determine the power of the operating system it controls.

The Genius Behind the System

IBM has developed its new MicroKernel to be small, fast, and powerful enough to support virtually any operating-systems design. MicroKernel owes much of its power to its location in the operating system. Most kernels sit at the bottom and handle low-level interfaces between programs and hardware devices. MicroKernel resides at the middle of the operating system, which allows the lowest-level device driver to become an object. That location not only allows *any* and *every* part of the operating system to be an object but it also allows *none* of the system to be an object, which means *any* operating-systems architecture, however object oriented or monolithic, can use MicroKernel.

MicroKernel's unique location also makes it easier to move an operating system between platforms, because issues like device compatibility become simple applications-programming problems. MicroKernel allows multiple operating systems to run concurrently on the same platform, provides common interfaces for all operating systems, and enables seamless communication across platforms—together these form the basis for the most flexible, forward-looking operating-systems design available.

MicroKernel products will ship during the next two years, starting with an OEM version that allows other operating systems to be ported to the new kernel. That will ship during the first half of 1993, as will a MicroKernel version of AIX for Intel-based PCs and a MicroKernel version of MS-DOS. The second half of the year will see a MicroKernel version of OS/2 that runs current OS/2 programs and will allow developers to code for future 64-bit systems, cross-platform compatibility, and built-in interplatform communications. Taligent's optimized object-oriented environment will ship in 1994, along with PowerPC-based systems.

Is MicroKernel good enough to save OS/2 and IBM in the PC marketplace? If you believe that better technology will always win, the answer is yes. But if you believe that market inertia will win, IBM has a tough road to travel against a very entrenched Microsoft. But maybe, just maybe, Microsoft will see MicroKernel as the right place for a new version of Windows, and then maybe, just maybe, Microsoft could use it to gain access to the PowerPC, and then maybe, just maybe . . . things could get very interesting all over again.

PHOTOGRAPH BY FRED STEVICH

"The most useful software I have ever owned."

Info World columnist Steve Gibson

Instantly stores and finds all your personal and business information. Helps you make brilliant decisions. New Windows version. Just $149.95!

Why did Steve Gibson say that? Because Info Select gives you a super-quick, super-easy, powerful new way to manage all your personal and business information. Unlike the structured software you are familiar with, Info Select uses a clever new free-form technique. Info Select will open up a whole new world to you. And now is the best time to discover this new type of software — because the leading free-form Personal Information Manager INFO SELECT is now available for Windows!

If you have notes, ideas, contacts or other unorganized RANDOM information, you need Info Select.

Finally you can clear away all the RANDOM information scattered across your desk: plans, notes, lists, actions, contacts, ideas, and much more. INFO SELECT will not only give you instant access to this important information ... it will help you make better decisions and see important new relationships. Try INFO SELECT risk-free today.

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INFO SELECT is like having a 'photographic memory' that gives you perfect, superfast recall of up to 64,000 items of information!

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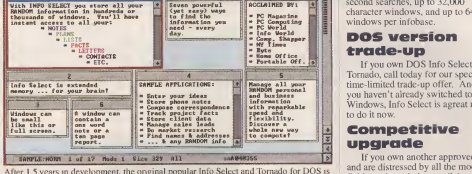
When Fred calls you on the phone, you'll display the seven windows on Fred before he finishes his first sentence! No more embarrassing pauses or scrambling for information.

Specifications

Average search speed	300 kb / sec
Platforms	Win, DOS
Organization	Free form
Customization methods	3
Windows per infobase	64,000
Characters per window	32,000
Search types	8
Fuzzy search	Neural
Data interchange methods	3
Sample forms	12



After 1.5 years in development, the original popular Info Select and Tornado for DOS is now available in the all-new 100% Windows version. Now is the time to discover the most popular free-form Personal Information Manager.

INFO SELECT also includes the world's first '3-D' word processor. You'll be amazed at how it works.

Imagine all your random information in convenient instant-access windows. The uses are endless.

Rave reviews

Editor's Choice "First rate"
*PC Magazine**

"Rarely do I recommend a product as wholeheartedly"
*David Harvey, Comp. Shopper**

"Beats the pants off just about everything else."
Jeffrey, PCMF

"As easy as remembering your own name."
*Patrick Marshall, Info World**
**DOS version*

The big picture

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Will I be better off doing this now or that later? Keeping priorities straight can make or break your career or your business. INFO SELECT lets you keep on top of what's hot.

Should you use an east or west coast supplier? To make decisions you need facts. Now you can view the facts any way you like ... as fast as you can think. You'll make the best decisions ever — and fewer expensive mistakes.

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What's all the fuss about PIMs (Personal Information Mangers)? Simple — you probably have more RANDOM information than any other kind and that's why PIMs are important. Why is Info Select the right PIM for you? Because Info Select is free-form. You won't waste days or weeks learning complex structures. You won't spend all your time moving between modes and fitting data in fields. Instead, you'll be up and running in minutes. Info Select will never get in your way.

Endless uses

Info Select can do much more than manage all your RANDOM information. Use it to organize business correspondence, sales leads, orders, and client notes. Track projects. Interrelate ideas. Catalogue parts, documents, and inventory items. Match buyers and sellers or doctors and patients. Edit E-mail. Store names and addresses, notes on magazine articles, and data about CD or video collections. Whether you're a professional, student, business owner, homemaker, entrepreneur, or hobbyist, you'll find countless uses for Info Select.

Feature packed

INFO SELECT lets you manage notes, plans, lists, facts, letters, contacts, and much more. You can search for a window or a group of windows related by a word or phrase. There is a fast sort, automatic address and phone number recognition, and five ways to see overviews. Save time with the dialer, date tickler, and searching by text or date ranges. Info Select allows you to add columns of numbers in text, use template or free-form windows, import and export files and databases, and much more.

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The optional LAN version allows integrated E-mail and sharing any kind of information (company rolodexes, policies, prices, customer info, etc.). It's your first step into the exciting new world of groupware! Ask about the five node LAN starter pack.

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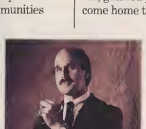
The Future of "Virtual" Computer Conferencing Looks as Clear as MUD

THE BUSINESS COMMUNICATIONS PICTURE IS LOOKING muddy, and that's good news indeed. I'm talking not about the stuff of childhood puddles but rather about MUD, a novel approach to computer conferencing that emphasizes informal, team-building interactions among communities of users.

MUD stands for Multiple User Dimension. Unlike traditional e-mail, MUDs are software-based, conferencelike environments that let two or more users interact simultaneously over a network. Instead of sending each other messages, "muddlers" typically engage in the sort of conversation we take for granted in face-to-face meetings. The result is a shared social virtual reality, with a communications richness approaching that of actual physical encounters.



Participants can modify their MUD world by creating new spaces and even populating them with new objects and other life forms. On a recent tour through one of the best-known MUDs, called LAMBDA.MOO, I encountered everything from a garrulous cockatoo to a cuckoo clock to half a dozen human visitors, all lounging in a cyberspace modeled loosely on the home of LAMBDA.MOO's creator, Xerox PARC researcher Pavel Curtis. Perched in the living room, the cockatoo had been programmed by one muddler to randomly repeat snatches of overheard conversation. This eventually became annoying, so at the group's request, the cockatoo's "owner" programmed a "gag" that was slipped over the parrot's beak, silencing the bird until it slipped the gag off about ten minutes later.

The Power of the Word

Surprisingly, MUDs are text-based. Visitors to LAMBDA.MOO don't don virtual reality goggles; instead, they interact with their world by typing simple commands and reading descriptions onscreen. For example, typing LOOK BIRD while in the living room yields a detailed description of a fiery-crested cockatoo sitting atop the mantel. Muddlers talk to each other using commands like Say and Whisper followed by a statement; other muddlers see the dialogue on their screens as "Curtis says, 'Did someone gag the cockatoo?' "

You might think that the textual nature of MUDs would be limiting, but anyone who has ever been lost in a good novel knows that text can be even more vivid than explicit graphics, because text encourages the reader to fill in the missing details. Imagine what the cockatoo described earlier looks like, and then consider the best-looking cockatoo one could create in VGA graphics. Which would you prefer?

Curtis explains that LAMBDA.MOO's text-based approach also makes it easy for users to be creative. Building, say, a tree in the best of today's graphics programs can be a nightmare. Conjuring up the same image in a text-based program requires little more than typing a description like "It is an old, gnarled pear tree with a hollow knot hole that has become home to a barn owl."

The Origins of MUD

MUDs like LAMBDA.MOO have their origins in network gaming. In fact, when the term *MUD* was coined in England at the University of Essex in 1982, it stood for Multi User Dungeon after the "Dungeons and Dragons" games that were popular at the time.

MUDs will continue to be fertile ground for gamers, but their biggest impact will be in other arenas. For example, Xerox's Curtis is helping launch ASTRO.MOO, a MUD that supports communication among astronomers around the globe. As Curtis says, "You go to a conference and meet the five other people in the world who work in your specialty, you have a fantastic discussion—and then you don't see them for a year. ASTRO.MOO is the answer for staying in touch." The programming language built into ASTRO.MOO will allow members to construct props, such as a shared calculator, that will support specialized discussions. The same capability could be useful to any community of specialists communicating via MUD, from trial lawyers to novelists.

Curtis is also working on a prototype multimedia MUD that augments text messaging with a simultaneous-voice feature and slow-scan video. Participants could sit at their desks and converse while seeing the other participants in windows onscreen. The result could be an entirely new form of video interaction. For example, I could log in to the MUD when I arrive at my actual office each morning and remain connected all day, in my "virtual office." Colleagues could "teleport" themselves to my office for a conversation, or we could meet in a virtual lounge for discussions with a larger group.

Within five years, social virtual reality will be a routine part of life.

These virtual spaces could exist entirely in cyberspace, or be mapped onto locations in the building. The lounge mentioned could be the virtual twin of the actual lounge down the hall. People sitting in the physical lounge could interact with MUD visitors via a large-screen display, allowing meetings to be attended both physically and electronically.

This sort of scenario could become a routine part of life for many business communities before this decade is out. Curtis is even more bullish—he believes that within five years, most people with computers on their desks will spend some part of their day in a social virtual reality. The details remain rather muddy, but I think he could be right. ◩

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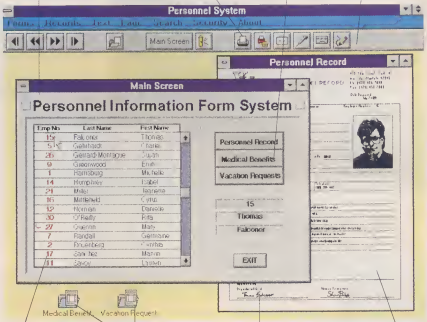

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Does the Rise of Megacompanies Spell the End of Innovation?

SHOULD THE GOVERNMENT BREAK UP MICROSOFT AND other large software companies? Competitors are complaining, but users aren't. During the past few years, giant companies have been swallowing and digesting smaller ones. With costs getting higher and higher, do garage startups make financial sense? Will all software be produced by a few megacompanies? Will a few tiny ventures be able to make it with breakthrough technologies? Is bigger better? John and Paul disagree.

SOMERSON: As usual, everyone dumps on big companies. The Federal Trade Commission is breathing down Microsoft's neck. It's the oldest lie of them all—"We're from the government and we're here to help you." Just like they said to the phone company.

DVORAK: Well, before we go on, let's not fool anyone. In fact, the government did the phone company and its shareholders a favor. The AT&T system is worth much more since the breakup. A business journal compared the equity status of IBM (not broken up by the government) and AT&T (broken up), and AT&T's stock was worth much more than IBM's and the spin-off companies were much more profitable than as divisions of the corporation. This just proves that bigger is not better. In fact, if Microsoft were busted up, it might become even more dangerous than it is now!

SOMERSON: That proves nothing of the sort, except that communications is a red-hot money-maker and that the FTC blunder had a golden lining for a bunch of greedy Wall Street types (but I repeat myself).

No, bigger isn't better when it comes to government or computers. But resources can be vital when developing and marketing PC products. Deep pockets and a stable of talented technicians obviously aren't a foolproof recipe for success, but if you were starting a company, wouldn't you want these? We've both seen too many small companies with good ideas fold or languish as bit players because they ran out of money and time.

DVORAK: Big companies with tons of resources can fold, too. Look at Ashton-Tate. It didn't fold, but it's an example of a company with enough resources to last forever, and it still faltered and had to merge with Borland to survive.

If I were starting a company, it would be great to have a huge bankroll. So what else is new? The point is that you don't have to have a ton of money and the resources of Microsoft to be a success. And I think you're better off *not* being as big as Microsoft. The best software still comes from the small team working alone in a garage. Toss me a list of interesting products and tell me how many were made by Microsoft or Lotus or Computer Associates.

SOMERSON: How about Lotus's Ami Pro, which you were slobbering over several months ago in this very space? How about Microsoft Publisher, with those Wizards that just won an MVP award in this magazine?

Ashton-Tate tanked because the management had its head up where the sun don't shine. Ditto MicroPro. The list is long. Grist for business school "avoid this" case studies.

Good software often does start out in a garage. But sooner or later most small operators see the writing on the wall and sell out to the big guys or just do an el foldo. My point is obviously *not* that all big companies are good. It's that today it's getting awfully tough for a small group of clever developers to scratch out a hit, let alone pop one over the wall.

DVORAK: The mechanism for failure is inherent in the structure of a big company. The monsters like General Electric and General Motors—companies that do succeed over exceedingly long periods—end up battling each other like old clay dinosaurs in a B-movie. Sure, maybe a jet engine comes out of the struggle, and maybe that jet engine is something we all benefit from. But the big companies manage to fail when they do the small stuff.

Take a General Electric alarm clock (please!). While it's cheap and functional (a General Electric executive told me it was reverse-engineered based on *Consumer Reports* guidelines in an effort to win a *Consumer Reports* recommendation), it's also inelegant and uninspired. The big companies like GE, though, have the resources to design a jet engine for a 747. Nobody in a garage can accomplish that, I agree. But a clock radio is quite different. So, too, is software.

SOMERSON: Clock radios? What in the world are you ranting about now? So America can't build small electronic consumer products. Sad, but what else is new? And what does this have to do with software? Besides, how can you say big

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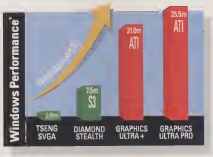

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companies can't write software? Is this the same John C. Dvorak who's been ranting and raving for the last year about the merits of OS/2? Which garage was that written in?

What may change the whole equation is do-object-oriented-development-yourself (except we need a better acronym than DOODY). If the tools are muscular enough and built in to the operating system, and if the interface is easy to master, we can all roll our own custom apps. Most software shares the same basic guts—getting user input, moving and storing data, doing a little math here and there, formatting and printing out the results. If we can drag-and-drop the appropriate modules, or have an application builder ask us some questions and put everything together for us, who needs conventional developers of any size?

DVORAK: An individual with some compilers and good debugging tools can code just about anything except maybe the complete computer system for a space shot to Pluto, which probably requires a lot of people to do. Visual Basic was coded largely by one independent contractor for Microsoft and then tweaked at Microsoft by the work-for-hire programmers up there. We're not talking about jet engines when we're talking about software. Software doesn't require the kinds of resources that heavy industry requires. You're stuck with an 1880 model of the world.

SOMERSON: We see tons of neat stuff from small companies that never go anywhere. They don't know how to package or market their products, and most couldn't afford to even if they knew how. The software is often rough around the edges and riddled with nasty bugs. The documentation stinks, the programs won't run on oddball configurations, and the developers are all working 90-hour weeks, but still there's virtually no customer support. And if the thing is any good, some predatory company either scarfs up the programmers or just steals the idea. End of story.

Putting together a slick, powerful, intelligent, bulletproof package has never been easy, but these days it's insanely complex. Considering all the memory and system kludges, BIOS incompatibilities, DMA and IRQ conflict madness, funky foreign motherboards, different DOS and Windows and OS/2 versions, different monitors, different address schemes, different drive adapters, different keyboards, different buses, different compression schemes, even different mice, it's a wonder any of this works at all.

The real question isn't "Is bigger better?" but rather "Is smaller even possible anymore?"

DVORAK: Well, it doesn't work from the big companies, either. All you're saying is that all these big companies have botched things so badly with the messed up code they've produced that nobody can do a good job. As for your tirade about little companies being gobbled up by bigger companies, I agree with you. It's time the government antitrust people got their butts in gear. I say bust 'em up. I've decided to be a probusiness Jeffersonian liberal.

SOMERSON: What are you, the poster boy for industry decline? Jeez, that's just what we need. More regulation. A total lack of standards. Underfinanced efforts that always come up short. It's your pathetic old lefty vision of quality control: too much control and not enough quality. Spare me.

Sure, big companies can drown their talented developers in committees, meetings, red tape, and corporate programming policies. But at least they have the resources it takes to cook up the code, debug it, document it, package it, flog it properly, and then pump out upgrades every few months.

Small companies can succeed every now and then with small niche products like utilities or games. And every so often, when the competition is rotten, a small company like DataStorm or Approach can field a winner, at least until a bigger company moves in for the kill. But mainstream, full-fledged business applications are just too tough for small developers to design, code, and sell.

DVORAK: What "more regulation"? I just want them to use the laws on the books. Ever heard the term *predatory practice?* That's what happens when a company gets too big. How is a predatory practice good? Since when did you become Mr. Monopolist? As for DataStorm, it just proves my point. Three or four developers can do a better job than Microsoft or Lotus. Have you ever seen Microsoft's telecommunications program? It stinks. You're completely wrong on all sides of this issue, Paul. As for your so-called full-fledged business applications being too tough, give me a break. Tell that to the Pacioli coder. Tell that to the Intuit people. Name one full-fledged business app that needs more than one or two coders!

SOMERSON: Give it a rest, John. This is the software industry you're whining about, not the Mafia. Why single out Microsoft? There are plenty of Fortune 500 companies that are bigger. You want to toss those on the bonfire, too? And earlier, when you said "bust 'em up," the " 'em" obviously referred to multiple software companies. You want to throw Lotus in as well? How about WordPerfect, Novell, and Borland, too, while you're at it? Fair's fair.

The FTC is hounding Microsoft because of complaints from competitors who are jealous of its success. The malarkey about selling both operating systems and applications is nothing but a red herring. If those competitors can't beat Microsoft by marketing better, hey, sic the government on them or tie them up in court—it's the American way.

Your bizarre arguments imply that by busting up Microsoft, the whole industry will suddenly get better, and all our problems will be solved. What a crock! All that would happen is that we'd get even less standardization than we have now. And we'd end up with nothing but weenie little software packages cranked out by "one or two (very exhausted) coders." Some future.

DVORAK: I'm amused at how month after month you fall all over yourself defending poor old Microsoft, as if it needed defending. My argument isn't bizarre by any means. As for the other software companies, if they get as big as Microsoft and control both operating systems and applications, then I'd bust them up, too. Small is beautiful, period.

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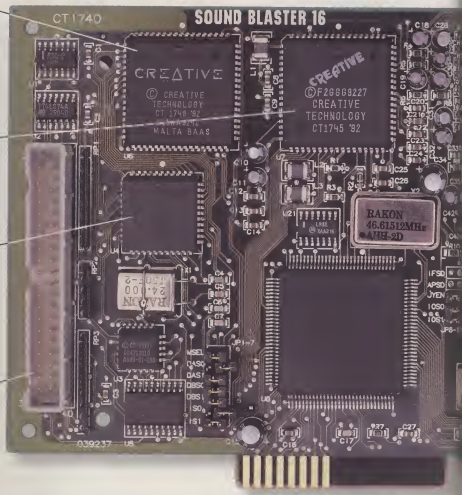

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JOYSTICK INPUT	YES		YES
FM SYNTHESIS	YES	YES	YES
OPTIONAL WAVE TABLE SYNTHESIS	YES		
MIDI INTERFACE	YES		YES
INTEGRATED MICROPHONE	YES	YES	
COMPATIBILITY:			
DOS	YES		YES
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By Marty Jerome

IBM, COMPAQ, AND DELL LABELS NOW APPEAR ON PCS PRICED TO RIVAL MAIL-ORDER AND SUPERSTORE NO-NAME CLONES. ARE THESE BRAND NAME SYSTEMS A BETTER VALUE?

FROM THE FIERCEST PRICING battle in the history of the PC industry comes a new breed of system. Lean, mean, and—above all—inexpensive, these PCs carry the monikers of Fortune 500 companies (AST, Compaq, Dell, Digital, IBM, and Zenith) but reflect the concern of the downsized, budget-conscious 1990s. They offer the value of a mail-order or superstore deal without the risk, because they're backed by industry leaders that will more than likely be in business months or years from now when you want to upgrade or need onsite repair.

You can snag one of the 486DX powerhouses we tested for close to $2,000. At a minimum, each has a 33MHz 486DX processor with 4MB of RAM, 120MB of storage, and a VGA monitor—a must-have configuration for running Windows at full throttle. Forget EISA buses, sophisticated caching controllers, and other pricey, high-end technologies. These machines are plain-vanilla boxes based on a tried-and-true ISA design, IDE drive interfaces, and industry-standard SIMMs. They're easier to upgrade and repair than PCs that use slick proprietary designs and cheaper to install and support as network clients. They offer raw horsepower over refinement, and manufacturing quality over cutting-edge components.

A LOOK INSIDE

Pull the case off any of these systems, and you'll find the kind of engineering and design you'd expect from big-shot systems makers. Contrary to popular rumors, these machines are hardly generic clones. Virtually all the systems come with brand name components: BIOS's from AMI and Phoenix; hard drives from Western Digital, Quantum, Maxtor, and Conner; and video chip sets from Tseng and Western Digital. All have VGA and drive interfaces integrated on their motherboards, which, thanks to the generous use of ASICs (Application-Specific Integrated Circuits), are surprisingly clean in design. With reinforced cases that sit evenly and have quiet fans, some of these PCs are downright handsome.

The six machines we review differ in feature sets and performance. Consider that Digital's DECpc includes an upgradable CPU *and* an S3 video accelerator on local bus—hardly a Computers "R" Us knockoff. Zenith Data Systems' Z-Station comes with a built-in Ethernet adapter, and the IBM PS/1 Consultant, with OS/2 driving the show, packs a full 8MB of RAM and a 211MB hard drive. (The IBM PS/Value Point 433DX was not available for review at this writing.) The Dell Dimension boasts dual floppy drives, six expansion slots, and a 64K cache. It sells for less than $2,100.

PERFORMANCE TRADE-OFF?

Compared to fast EISA systems, the performance trade-offs are less onerous than you might suspect. Unless you're pushing very large files (such as 24-bit graphics) across the bus, system throughput can be urged along with relatively cheap technologies (beginning with the 33MHz 486DX CPU itself). Memory has gotten much faster and much cheaper in the past five years. So have IDE hard drives, which, with manufacturing improvements and smarter caching schemes, now offer access times equivalent to far more expensive (if moribund) ESDI drives.

Our Windows, CPU, hard disk, and video benchmark tests separated the wheat from the chaff. We also put each machine through a set of chores that measures how fast it recalculates a spreadsheet, redraws a chart, and executes a macro. Both the DECpc and the AST Bravo outpaced every other machine here. The Z-Station held up adequately, and, with an optional graphics accelerator, could probably keep up with the DECpc.

We chose 33MHz 486-based systems for purposes of comparison because all six manufacturers include this platform in their low-cost lines. At press time, AST, Compaq, and IBM offered 50MHz models; AST and IBM also make 66MHz DX2 versions. Other makers will assuredly follow suit as the 386 CPU recedes from users' horizons.

Purchase decisions should ride equally on the machine's feature set, its expandability, its upgrade path, its warranty and support, and the likelihood that the manufacturer will be around in three years.

AST Bravo 4/33 Model 123B

IN BRIEF: The Bravo's performance proves how much life is left in the ISA design.
PROS: Fast, well designed, eminently upgradable.
CONS: Somewhat bulky size.

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MOVE OVER BRAVO 3/25S. Just as AST's 25MHz, Am 386SX-based PCs began to put heat on the mail-order crowd, the company bumped up the top of the Bravo line to include the 4/33, which we tested, as well as 50MHz and 66MHz DX2-based systems. The clock-doubler models slap $350 to $700 onto the price of the 4/33. All Bravos are upgradable, however; buy the 4/33 now, and you can upgrade if it proves too lethargic.

The Bravo was clearly designed for tinkerers. Flip the zero-insertion-force lever on the CPU daughterboard, and the processor pops out. Expansion room is plentiful—four full-size slots and two 5¼-inch and two 3½-inch drive bays. Though SIMM sockets are easy to reach, you have to remove the power supply to upgrade video RAM—a minor design flaw. Overall, though, the ergonomics are excellent, especially since you can switch almost all hardware settings through the BIOS-based setup routine instead of through fussy jumpers.

The 4/33 demonstrates how much life is left in the ISA design. The machine's configuration is unremarkable, yet the system performed near the front of the pack in disk and processor chores (the DECpc, outfitted with a graphics accelerator, blew it away on graphics tasks). A large 256K cache and a very fast Quantum 120MB hard drive contribute to the excellent throughput.

Despite its bulky size, we liked the 4/33 for its speed and expandability. The Model 123B includes 4MB of RAM, a Super VGA display (including an integrated 8514/A pass-through connector), one year of onsite service, Windows 3.1, and a mouse.

The Heavyweight Champion Of Windows Comm Software Just Became Even More Of A Knockout.

The first round was no contest. Long before we won the *PC Magazine* Editors' Choice Award, Crosstalk® for Windows was the undisputed title holder. *Software Digest* called it the "best of the graphical communications packages." *InfoWorld* named it "Product of the Year." And it won the *Windows Magazine* Readers' Choice Award.

But for all its power, we knew it had the potential to pack an even bigger wallop.

New Crosstalk For Windows 2.0. A Technical Knockout.

PC World says it "jumps far ahead of the last version" and "advances the state of the art in modem software." And you can see the difference the minute you start it up. The interface is more functional, more convenient and just downright fun to use. A new QuickBar™ tool menu turns common tasks like downloading a file into a simple matter of clicking on an icon. And it follows Windows™ 3.1 interface standards to the letter.

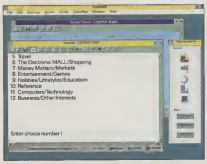
But we didn't just put a new face on an old program. We also taught it a lot of new tricks.

For instance, Crosstalk for Windows now includes FTTERM and IND$FILE support for connection to IBM® mainframes, as well as HP® and WYSE® terminal emulation. There's also a text editor built right in. You can edit information and send it out again, without leaving Crosstalk.

We Hit It Right On The Button.

Push a button and run a script, with our new object QuickPad™ feature. Even non-programmers can design custom controls with objects such as buttons, icons and pictures. Then embed a text string or an entire script in each object.

In minutes, you can design a whole new front end for a host system and make it as friendly–and as personalized–as you want. We even include pre-built QuickPads for accessing and navigating the major on-line services.



Windows within Windows: QuickPads float on your screen, ready to run entire scripts at the push of a button.

Now's The Time For You To Get Pumped Up.

You can have multiple comm sessions running at once–working on a VAX® link while you're connected to CompuServe®, for instance. You can remap your keyboard by moving keys on a graphical keyboard layout. Just drag and drop.

> *Crosstalk for Windows sets the performance bar even higher for competitors in the Windows communications market.*
> —*PC World, October 1992*

You can even import dialing directories from the DOS version of Procomm Plus.™ (We want to make everything easy for you, including *switching* to Crosstalk.)

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1-800-348-3221, ext. 25K.**

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*Offer expires June 30, 1993, and is available in U.S. and Canada only. Must show proof of ownership. **If outside the U.S., call (404) 475-8380.

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Circle 129 on reader service card.

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Convert Uncompressed Drives	✓	✓	✓
Floppy Disk Support	✓	✓	✓
Integral Disk Cache	✓		✓
Automount	✓	✓	
Menu-Driven Interface	✓	✓	
Universal Data Exchange (UDE™)	✓	✓	
Consolidate	✓	✓	
Recompress	✓	✓	
Data & Image Compression for Windows	*NEW!*		
Optibase® JPEG Image Compression	*NEW!*		
Improved Performance	*NEW!*		
Extended UDE Support	*NEW!*		
Password Protection	*NEW!*		
Tune-Up Analyzer	*NEW!*		
Compression Preview	*NEW!*		
Deinstall	*NEW!*		

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Circle 162 on reader service card.

Compaq ProLinea 4/33 Model 120

IN BRIEF: The machine that started the PC price war is quickly being eclipsed.
PROS: Sleek, quiet, excellent construction.
CONS: A mediocre performer.

- $1,679
- **Compaq Computer Corp.**
- P.O. Box 692000 Houston, TX 77269-2000
- (800) 345-1518, (713) 370-0670

COMPAQ'S PROLINEA LINE, the opening shot in the PC price battle, proved that high-performance PCs can go easy on the wallet. Sales have soared, and Compaq has had to add shifts to two of its factories to keep up with demand. Unfortunately, other PC manufacturers have caught up with—and surpassed—Compaq.

If nothing else, the ProLinea confirms that low-cost PCs don't have to be ugly. Its beauty involves a trade-off, however: The trim 4/33 gets low marks for expansion. With its hard disk and two floppy drives installed, it accommodates only one other half-height storage device. The SIMMs are very hard to reach. And you might be able to squeeze three expansion boards into its side-mounted 16-bit slots—on a good day. It gets high marks for desktop civility, though. Quiet and unobtrusive, it's the perfect node for a network. You can load the server down with storage devices, peripherals, and other technojunk while keeping the desktop system simple and elegant.

The 4/33 is a middle-of-the-road performer: It's better than the IBM PS/1 Consultant Model and on a par with the Dell Dimension 486DX/33. An external CPU cache would have helped processor and memory tasks, and faster video would improve its performance under Windows. It's certainly no slouch, however, and with the money you save buying the ProLinea instead of the Deskpro 4/33i, you can buy an ATI Graphics Ultra Pro video card ($599) that will make Windows sing.

COMPAQ PROLINEA 4/33 MODEL 120

Dell Dimension 486DX/33

IN BRIEF: The Dell offers both excellent expandability and service.
PROS: Includes a rich feature set and is backed by Dell's reputation for service and quality.
CONS: Unimpressive performance, not upgradable, difficult to remove hard disk.

- $2,099
- **Dell Computer Corp.**
- 9505 Arboretum Blvd. Austin, TX 78759-7299
- (800) 289-3355, (512) 338-4400

A COMPANY THAT arrived by undercutting competitors on price, Dell suddenly finds itself defending its turf. Against all odds, it managed to put the Dimension 486DX/33 on the market with a price lower than that of the ProLinea, only to see Compaq reduce the ProLinea's prices even further. Indeed, the DX/33 provides a richer feature set than the ProLinea, but a better buy it's not.

The DX/33's full-size chassis holds six 16-bit expansion cards. Even with a hard drive and both 3½-inch and 5¼-inch floppy drives (which come standard), two half-height drive bays remain open. SIMM sockets are within easy reach for adding memory, but removing the hard drive is a monumental task requiring you to virtually disassemble the machine.

Even with a 64K external cache, performance on the DX/33 was underwhelming. Dogged by slow memory and a lazy hard drive, the machine managed only slightly faster throughput than the IBM. We'd happily forfeit some of the DX/33's expandability for a little more chutzpah.

Still, the system as a whole is alluring, especially if you're looking for expandability. Windows 3.1 and a mouse come standard, as does a Super VGA color monitor. You can beef up the standard model with a wide array of video and hard drive options. And the machine is backed by Dell's trademark support: a year of onsite service and toll-free fax and phone.

Low-Cost PCs	BRAVO 4/33 MODEL 123B AST RESEARCH	PROLINEA 4/33 MODEL 120 COMPAQ COMPUTER	DELL DIMENSION 486DX/33 DELL COMPUTER
SYSTEM SPECS			
List price [1]	$1,895	$1,679	$2,099
Hard drive as tested	120MB	120MB	120MB
Case style	Midsize desktop	Slimline	Full-size desktop
Minimum/maximum RAM	4MB/64MB	4MB/16MB	4MB/64MB
External CPU cache	256K	None	64K
Free slots	4	3	6
Free drive bays	2	1	2
Upgradable CPU	Yes	No	No
Bundled software	Windows 3.1	Windows 3.1, PFS:WindowsWorks	Windows 3.1, DOS 5.0
Mouse included	Yes	Yes	Yes
SYSTEM PERIPHERALS			
IDE drive	Quantum 120	Conner 120	Conner 120
Floppy drives	3½-inch	3½-inch, 5¼-inch	3½-inch, 5¼-inch
Resolution at 256 colors	1,024 by 768	1,024 by 768	640 by 480
Video RAM	1MB	512K	512K
EDITORS' RATINGS			
Windows application performance	2	3	2
DOS application performance	1	1	2
CPU/memory performance	2	3	3
DOS graphics performance	1	1	1
32-bit software performance	1	1	2
Expandability and upgradability	1	4	2
Design/ergonomics	1	3	4
Hardware/software bundle	2	4	2
Warranty and support	1	1	1
Overall value	1	2	2

[1] Price is for test configuration: All systems are 33MHz 486DX ISA-bus PCs with at least 4MB of RAM, a noninterlaced VGA monitor, two serial ports, one parallel port, and one dedicated mouse port.
[2] No list prices; street prices set by individual dealers.
[3] ISA slots; proprietary slots not included.

What About Service and Support?

The second front in the PC price war is service. Once cantent ta produce high-quality machines and leave support and repairs ta their vast network of dealers, tap-af-the-line brand makers like AST, Campaq, Digital, IBM, and Zenith now play a more direct role in keeping their custamers' PCs up and running.

The pressure for better support has partially came fram mail-arder houses, such as Dell, that provided ansite service, avernight shipment af replacement parts, and tall-free technical support while these bigger names relied an dealers. The other contributar was the highly uneven quality af service fram dealers, which has tarnished the reputatian of leading systems makers in the past few years.

Today virtually all manufacturers realize that they must offer competitive service; a cheaper price far a system daesn't mean that the vendor skimps an the support end. AST, Compaq, Dell, Digital, IBM, and Zenith affer deals on their law-cost lines that are similar to the anes an their top machines. And thaugh each company takes a slightly different route, no single company hos cornered the market an support.

AST, for example, offers ane year of onsite service for the madel we tested (the Bravo 4/33 Madel 123B) it does, however, leave its other madels to regular dealer service. The campany offers toll-free technical suppart, fax-back service, and a bulletin baard service far all its machines.

BEST VALUE

DECPC 433DX LP DIGITAL EQUIPMENT	PS/1 CONSULTANT MODEL 2155-G76 IBM	Z-STATION 433DH MODEL 120 ZENITH DATA SYSTEMS
$2,299	$2,600–$2,800 [2]	$2,179
120 MB	211MB	120MB
Slimline	Full-size desktop	Full-size desktop
4MB/64MB	8MB/32MB	4MB/64MB
128K	128K	None
3	5	4 [3]
3	3	2
Yes	No	Yes
Windows 3.1, DOS 5.0	OS/2 2.0, Microsoft Works for Windows, Prodigy, The New Print Shop, Quicken for Windows	Windows 3.1, Windows for Workgroups; client shells for NetWare, LAN Manager, and VINES
Yes	Yes	Yes
Quantum 120	Maxtor 211	Western Digital 120
3½-inch	3½-inch, 5¼-inch	3½-inch
640 by 480	1,024 by 768	1,024 by 768
512K	1MB	512K
1	3	3
2	2	2
1	5	4
1	2	2
1	5	4
1	2	1
1	4	1
2	1	1
1	1	2
1	3	2

EXCELLENT < 1 2 3 4 5 > DISAPPOINTING

Compaq recently established a toll-free number for technical-support questions, and the ProLineos come with one year of manufacturer-backed onsite service.

Dell also offers a year of onsite service, along with toll-free fax and phone support.

Digital provides one year of onsite service and a toll-free support line.

IBM still handles technical-support questions via a forum on Prodigy (all PS/1s ship with a modem and Prodigy software). Big Blue also guarantees repair or replacement of any defective port, usually within 48 hours.

Zenith provides onsite service only as an option ($201). Technical support is toll free.

BEST VALUE: DECpc

Because the only reason to buy a 33MHz 486 is for unadulterated speed, you should look for a system that keeps all system bottlenecks to a minimum. The DECpc 433dx LP comes outfitted with a speedy Quantum 120MB hard drive to keep input/output chores humming. It also comes with a graphics accelerator on local bus—indispensable for running Windows full soil.

Though several PCs now sport such technologies, precious few cost less than $2,300. Among those that do, almost none offer the manufacturing quality and the attention to design detail found in the DECpc. Dollar for dollar, it's one of the best values you'll find.

Which Class of PC to Buy

The new low-cost lines of brand name PCs have made the choice of what type of system to buy perplexing. Do you buy a cheap mail-order or superstore PC stocked with

	MASS MARKET	LOW-COST BRAND NAME	MIDRANGE BRAND NAME
Performance	3	3	2
Feature set	3	3	2
Dollar value	1	1	3
Design quality	4	2	1
Bundle	1	3	3
Expansion capabilities	1	4	3
Cost of upgrade path	1	2	3
Peace of mind	5	1	1
Who it's for	Sophisticated users on very tight budgets. Unintimidated by PC architecture and design, they'll shop third-party suppliers for cheap replacement or upgrade components.	Users on strict budgets whose computing needs change very little: Their need for more power and greater expansion increases gradually. They can't afford the downtime to search for replacement parts and service; they count on getting back to work as soon as possible.	The majority of power users who run mainstream applications need this class of machine. Their computing needs grow quickly. Their time is too precious (and expensive) to squander on a broken computer.

Compare Mail-Order and Top-of-the-Line Systems

One upshat of the PC price war is the bewildering array af PCs ta chaase fram. What exactly is the difference between a Compaq PraLinea and the campany's high-end Deskpro/M series—besides the $1,500 gulf? Is there any real advantage ta buying an IBM over a Gateway 2000?

Na definitive answers emerge, but twa canclusians stand out. When machines are similarly canfigured, price differences between brand name, tapflight madels and bargain-basement pawerhauses are less than yau might think, both within and acrass praduct lines. Alsa, practical differences between the twa classes af systems have less ta da with feature sets than with the type af user each PC best suits.

Compaq vs. Compaq

Within Campaq's three system lines (PraLinea, Deskpra/i, and Deskpro/M), far example, a 33MHz 486-based PraLinea casts $1,679 when bedecked with 4MB af RAM, a 120MB hard drive, and a VGA manitar. Outfit the mare prestigiaus Deskpra/i with the same canfiguratian, and it costs $2,349—a difference of anly $670. Thase extra dallars fetch an upgradable CPU, an extra drive bay, an extra expansian slat, and Campaq's much-tauted Business Audia.

Hap up ta a Deskpra/M, but replace the VGA manitar with Campaq's magnificent EISA QVisian manitar, and yau'll pay $3,369. Suddenly, yau're laaking at a $1,690 (list price) difference between the ProLinea and the Deskpra/M—nat exactly small patataes. The *M* stands for *madular*, and indeed, virtually every campanent on the Compaq's top-dag Deskpro can be upgraded. The Deskpra/M alsa includes a high-perfarmance EISA bus and high-resalutian video.

Yes, the Deskpro/M is faster and graphically far superior to the PraLinea, and it houses ample room for expansian and can be upgraded far into the future. But daes it baast $1,690 warth af superiarity? Far engineering and design applicatians, far high-end number-crunching and scientific madeling, and far pawer-hungry 32-bit software, the answer is unequivacally yes. The same is true with tap-of-the-line systems fram AST, Dell, and IBM.

Certainly, the price-perfarmance curve begins ta flatten with high-end systems. But for users wha push the limits af performance—whose wark makes hefty cantributians ta their campany's bottam line—$1,690 (which can be depreciated) merits not a secand thaught.

Compaq vs. Gateway 2000

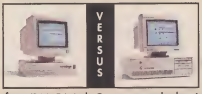
The vast majority af users can settle for slightly less performance in return far mare slats and drive bays, greater storage capacity, and a cheaper upgrade path. As a result, armies af users have turned ta mail-order giants such as

software? Or da yau spend a little mare for a system from a well-known manufacturer? Here's a guide to what each class af PC affers and what type af user each suits.

TOP-OF-THE LINE BRAND NAME	
1	
1	
5	
1	
3	
1	
4	
1	

High-flyers like these are aimed squarely at users of engineering, design, financial and scientific modeling, and ather performance-hungry applications. Price matters little to these users because their anly alternative is a RISC workstation casting far mare.

EXCELLENT < 1 2 3 4 5 > DISAPPOINTING



Zeas and Gateway, which pramise the mast PC for the lawest price. Clearly, budget-beating systems fram IBM, Digital, Campaq, and ather industry leaders are aimed at these mail-arder hauses.

Haw does the Gateway fare against the systems we review? Far $2,295, yau can laad a 33MHz 486 with 4MB af RAM, twa VESA-campatible lacal-bus slats, a 200MB Western Digital hard drive running an lacal bus, a 64K cache, an ATI Graphics Ultra lacal-bus videa card, a manitor, Windaws 3.1, *and* yaur chaice af any af several majar applicatians. The CPU is upgradable and the machine cames with six ISA slats. And the Gateway perfarms near the tap af the pack, better than the AST and neck and neck with the Digital.

Faced with camparable systems, equivalent levels af service, and prices in the same ballpark, many users will chaase an established name aver a relative upstart. Big campanies are mare likely ta be araund faur years hence when yaur system needs repairs. Or sa the line gaes.

Users afraid af lasing support far their machines—or a large base af their machines—will sleep better if they purchase systems praduced by industry leaders. But if taday's dallar value autweighs yaur fears af tamarraw, the Gateway is a very attractive machine.

BEST VALUE

DECpc 433dx LP

IN BRIEF: Wha'd have imagined a year aga that yau could get as much perfarmance and as crafty a design as yau'll find in the DECpc for under $2,500?
PROS: Superb Windaws machine with accelerated videa an lacal bus, and an accessible, upgradable design.
CONS: Nane.

- $2,299
- **Digital Equipment Corp.**
- 146 Main St. Maynard, MA 01754-2571
- (800) 722-9332

BACK FROM THE brink of financial cataclysm, Digital Equipment Corporation has reentered the computer business by selling machines both through resellers and by mail order—an option that Compaq and IBM also considered but then dismissed. If you were ready to write DEC off as a relic of a bygone era, you're in for a big surprise. Dollar for dollar, the DECpc 433dx LP is one of the best computing systems you can buy.

The DECpc manages to stock its sleek box with a CPU that's upgradable either through Intel's Overdrive socket or by way of a daughterboard. The CPU is augmented with 128K of external cache and 4MB of quick (70-nanosecond) dynamic RAM. The DECpc uses the same blisteringly fast Quantum hard drive that the AST employs. What's more, the machine features an S3 graphics accelerator running on local bus that makes Windows fly.

Indeed, the DECpc blew past every machine reviewed here in graphics chores, and ran neck and neck with the AST in processing and disk-intensive benchmark tests. Owing to the nature of video accelerators, text-mode video chores actually ran slower than with non-accelerated video. But for Windows-based work, you can't beat this machine.

Slim and demure, the DECpc is even pleasing to the eye, and its variable-speed fan is one of the quietest you'll find. Slip off the DECpc's case, and you'll spy three open

half-height drive bays and three somewhat cramped side-mounted expansion slots. Memory is situated front-and-center—easy to upgrade. Even the ½MB of dual-ported video RAM lies within easy reach.

Here's a tip: Upgrade the DECpc's video memory to a full megabyte, and slap another 2MB of system RAM in the machine (which you can always make use of). Pony up for the Super VGA monitor (you can get 0.28mm dot pitch for $450 extra), then make off like a thief with this machine. You'll be hard-pressed to find a better buy.

IBM PS/1 Consultant Model 2155-G76

IN BRIEF: The IBM is slow but feature rich.
PROS: Great package for the money: 211MB hard drive and 8MB of RAM, modem, terrific software bundle.
CONS: Unimpressive performance, expensive.

- $2,600–$2,800 (Prices set by individual dealers.)
- **The IBM Personal Computer Co.**
- Contact individual dealers.
- (800) 426-2468

ANYONE WHO STILL thinks of the IBM PS/1 as a slotless AT-class PC with a fixed monitor should know that the machine has grown up in the two years since its debut. In a sense, the PS/1 was the first brand name PC aimed at budget-conscious consumers. It has gained processing power, expandability, and a richer feature set. Nevertheless, it can't seem to shake the image of being a home machine.

Much of this image is due to its performance, which is abysmal. Lethargic memory, plodding video, a poky hard disk—it's almost as if performance bottlenecks were built into the system. To our disappointment, the PS/1 lagged woefully behind every other machine we tested for this roundup.

Don't discount it out of hand, however. The PS/1 somewhat makes up for its lethargy with its seductive overall package. It's the only machine we reviewed to come standard with a 211MB hard drive and 8MB of RAM (then again, it's the only PC reviewed here to come with the piggish OS/2 operating system). Also, the software bundle is unbeatable—at least for the home office: OS/2 2.0, Microsoft Works for Windows, Quicken for Windows, Prodigy, and the New Print Shop. You also get an internal 2,400-bit-per-second MNP5 modem and a mouse.

The PS/1's storage capacity and software bundle alone are worth the $2,600 to $2,800 you'll pay at a dealership. Also, there's plenty of room for expansion: Included are both 3½-inch and 5¼-inch floppy disk drives, five side-mounted expansion slots, and one open half-height drive bay. The monitor is now detachable, and IBM stocked the PS/1 with a full megabyte of video memory.

Despite Big Blue's logo, the design doesn't convey much prestige. It's big and boxy, and you can upgrade memory to only 32MB. Also, an inexcusable design flaw plagues the machine: It takes only 1MB or 4MB SIMMs—and all of the sockets come filled. So to upgrade the standard 8MB of RAM, you must throw away one or more of the perfectly good memory SIMMs that come with the PS/1. This flaw and the machine's half-hearted performance make it better company for weekend workers and moonlighters than for users in a corporate milieu.

IBM PS/1 CONSULTANT MODEL 2155-G76

Zenith Z-Station 433Dh Model 120

IN BRIEF: An excellent client workstation for a Windows network.
PROS: Marvelous design allows quick and easy upgrades.
CONS: Middling performance.

- $2,179
- **Zenith Data Systems**
- 2150 East Lake Cook Rd. Buffalo Grove, IL 60089
- (800) 553-0331, (708) 808-5000

REPRESENTATIVES FROM Zenith Data Systems like to brag about how gorgeous their systems are. We like them, too, despite their immensity: They're austerely white and pleasingly modular. Unlike other systems in this review, the Z-Stations start out cheap, but a wide range of upgrade options can quickly transform them from $2,200 machines into $6,200 machines. Self-discipline and a tight budget, though, can put a lot of Z-Station on your desk for less than $2,200.

Goodness knows, Z-Stations are expandable systems. CPUs are upgradable. A dedicated slot for a graphics accelerator, a dedicated slot for a SCSI adapter, and an Ethernet port on every machine augment the four ISA expansion slots (three 16-bit, one 8-bit). Flash BIOS is standard. And you can stock the two full-height drive bays with either IDE or SCSI drives (up to 400MB).

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Circle 223 on reader service card.

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•

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Circle 237 on reader service card.

ZENITH Z-STATION 433DH MODEL 120

Performance on the Z-Station was average—certainly not blinding. The fast Western Digital 120MB hard drive was undercut by relatively slow video (the accelerator option costs only $129 and is well worth the improved performance). And the machine could benefit from an external cache, which, surprisingly, isn't offered, even as an option.

It bears repeating that you'll be duly impressed by the Z-Station's design. Upgrade modules literally snap into place. The case pops off with a single screw that you twist with your fingers. And there's no faster way to hook onto a network (client shells come preloaded on the hard drive along with Windows) or to connect a SCSI-based CD-ROM drive. And with Microsoft Windows for Workgroups preinstalled, the machine is clearly destined for corporate environs.

WHAT'S AHEAD

When IBM and Compaq waged war with other low-cost lines, users expected to see every systems maker under the sun scrambling to produce stripped-down, no-nonsense boxes that are high on performance and low on cost. The AST Bravo exemplifies the very best of this breed. Digital's DECpc, on the other hand, augurs something far more dangerous to an industry already bloodied by a price war. Namely, it puts state-of-the-art technology on the table at the same price as those stripped-down boxes. Digital has no pricey Deskpro/M series of systems, no exorbitant PS/2 line of high-end PCs. If this strategy pays off, neither (for much longer) will Compaq or IBM. ◪

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intel inside

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Accelerated Video (512 KB Video RAM)
Ultra VGA 1024NI Monitor
(14", 1024 x 768, .28mm, non-interlaced)
MS-DOS 5.0/Microsoft Windows 3.1/Mouse

DIMENSION 486DX2/50s

$2,699

Lease: $100/MO.

i486 DX2 50 MHz System
8 MB RAM
64 KB Cache
212 MB (15 ms) Hard Drive
6 Drive Bays
6 Expansion Slots
Dual Floppy Drives (3.5" and 5.25")
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PC/COMPUTING'S TORTURE TEST

10 TOP 486

NOTEBOOKS . . .

We **froze** them.

We **baked** them.

We **shook** them.

We **dropped** them.

We **tumbled** them.

We even **spilled** coffee on them.

WELCOME TO OUR LITTLE SHOP OF HORRORS.

The methods of torture and implements of inquisition have never been more broadly arrayed or fiendishly devised than for this third installment in *PC/Computing*'s ongoing effort to test the durability of notebook PCs and to uncover the Best Values among them. In fact,

BY SCOT FINNIE

most of the manufacturers that agreed to send victims our way this year didn't even want to *know* what we were going to do to their defenseless machines. But you're about to find out every gruesome detail.

Why torture notebooks? Because the simple fact is that unless you (and all the people around you) are perfect, some mishap will befall your notebook sooner or later. The dangers are ubiquitous. Do you sometimes drink coffee over your notebook before you're really awake? Have you ever left a notebook in the car unintentionally on a very hot or very cold day? Ever check one on to an airplane as baggage in a moment of weakness? Or come close to knocking it off your desk while reaching for the phone?

Because notebook PCs pack masses of sensitive electronic and mechanical equipment into very small spaces, their vulnerability to these dangers is acute. And when you're purchasing a high-ticket item that amounts to a second PC, durability is an important consideration. Some accidental damages, we've found, essentially total the unit—and the cost of the repair is so high that it makes more sense to buy a new model. If a drop both cracks your notebook's display and obliterates its hard drive—which is not as unlikely as it may sound—you might as well start comparison shopping.

Our tests show, however, that manufacturer forethought in laptop design can go a long way toward preventing damage. This year's crop of ten Intel 486SX- and Cyrix 486SLC–based notebooks were much hardier, on average, than models we've tested in the past. Of the 20 386SX/20 notebooks we distressed last year, 6 emerged from the experience with cracked LCD screens—an expensive item to repair.

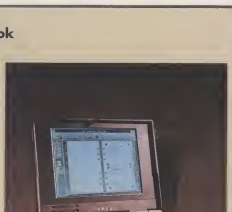
This year, not one of our durability marathoners suffered from this injury. That's doubly significant because we increased the severity of the drop tests and added a new, potentially screen-cracking hazard at the end of our series of trials—the clothes dryer tumble test. (For a blow-by-blow account of the durability test results, see the chart "Survival of the Fittest," page 148.) And now, after three separate forays into testing notebook pratfalls, concussions, and overexposures, we think we have enough data to begin predicting durability on the basis of visible design features. To get a handle on the likely fate of your own notebook in a disaster scenario, check out the "Notebook Buyer Survival Guide," page 158.

Durability isn't the only consideration in choosing a notebook, though, so before the torture began, we benchmarked and rated each machine's CPU, memory, video, hard drive, battery, and power-management performance. We also weighed and measured them, and we rated portability, keyboard design and feel, display quality, port configurations, options, warranties, and prices. (Ratings and data on these and other criteria appear in the chart "486 Notebook Torture Test: Features and Ratings," page 154.) And of course, we spent a great deal of time using each notebook ourselves. Read on for our conclusions.

BEST VALUE 486 Notebook

Picking the Best Value in a product category as competitive as notebook PCs is a difficult venture. But we've caught 486 notebooks at the beginning of the wave, when it's still possible to wade through them without hip boots. And as it happens, there's a clear top choice among these powerful but diminutive machines.

The **Twinhead Slimnote 4SX/25** wasn't quite the best in any one area we tested, but it's the best all-around 486 notebook in the bunch—possibly the best we've ever tested if 486 performance is an important criterion. The Slimnote offers high degrees of portability, durability, performance, upgradability, and value. Want to take it to the 486DX/33 level? No problem. Looking for a thin-film transistor active-matrix color display? Twinhead is just releasing one. Want to take it on so



Twinhead Slimnote 4SX/25

far? It'll make it. Need an integrated pointing device? It comes standard. Don't want to pay an arm and a leg for it? You won't. On the whole, the Slimnote is as close to perfect as current 486 notebook PCs get. To be sure, AST, Compaq, Zenith, and others will contribute to the market in the months to come. But for now, the Slimnote reigns supreme.

Another 486 notebook that we tested deserves an honorable mention for being small and light, incredibly fast, and well equipped with a variety of helpful features: the **Texas Instruments TravelMate 4000 WinSX/25.** The big knock on the TravelMate is durability, and it could also use screen and keyboard improvements. But all told, you won't be unhappy with this, the best-performing machine of our review. And at $2,799 with a 120MB hard drive, TI's TravelMate 4000 is a great value.

PHOTOGRAPHS BY DON DREITWEIGH

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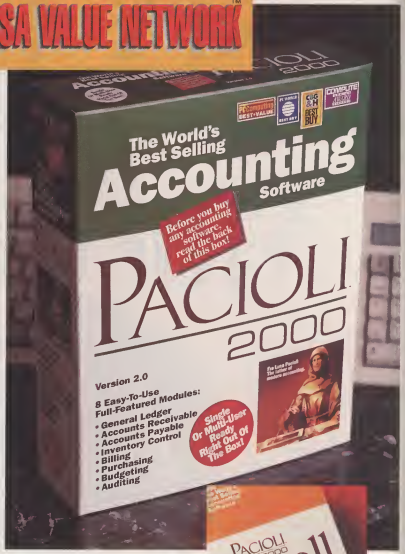

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ALR Ranger M486SX/25

ALR Ranger M486SX/25

IN BRIEF: This newer, upgradable Ranger model is powerful and thoughtfully designed, but it lacks broad durability and is too large and heavy.
PROS: Upgradable CPU; great keyboard.
CONS: Bulkier than most; not spill resistant.

- $2,595
- Advanced Logic Research
- 9401 Jeronimo
- Irvine, CA 92718
- (800) 444-4257, (714) 581-6770

IF BIGGER WERE better, the ALR Ranger M486SX/25 would have an advantage. In a notebook, however, a weight of nearly 7.5 pounds and a thickness of 2.25 inches is nothing to boast about, and it's no guarantee of durability in the event of spilled coffee.

Looking under the Ranger's keycaps, we thought the machine would do a fair job of holding back the tide, but that wasn't the case. The coffee spill had multiple, severe effects on the Ranger, knocking both its keyboard and the power switch out of commission. Had the Ranger made it through the coffee spill, however, it would probably have done better than most in the grueling drop and tumble tests. It's a sturdily built model with a 180-degree LCD hinge and a well-padded carrying case.

The spill test aside, the Ranger ties with the Tandy for the best keyboard of the bunch. And our guess is that most people would prefer the Ranger keyboard, since its keycaps are larger and more widely spaced. Another appealing feature is a lightweight pull-out handle similar to the one found on Zeos's 386SX/20 notebook. It's a convenient feature that all manufacturers should copy.

You can upgrade the Ranger to either a 486DX/25 or a new 486DX2/50. ALR has also recently introduced models with hard drive capacities as high as 210MB. The impressive list of options includes a docking station and Ethernet and SCSI adapters. And since notebooks are usually proprietary designs, buying from a vendor that makes upgrades easy means you probably won't need to buy a whole new model when you really only need one option.

ALR has a passive-matrix color version of the Ranger and plans to announce and ship an active-matrix thin-film transistor color model by year's end. On balance, though, despite excellent upgrade options and an attractive price, the Ranger's poor portability score and insufficient durability make it difficult to recommend.

BCC Avanti 486

IN BRIEF: If you frequently work on a plane, the Avanti is worth considering because of its space-saving LCD hinge design.
PROS: Very durable; great standard features.
CONS: Slow hard drive; case height is 2.75 inches high at the rear.

- $2,795
- BCC
- 1610 Crane Court
- San Jose CA 95112
- (800) 827-4222, (408) 944-9000

THE AVANTI 486 is a great value—with some serious qualifications. For $2,795, you get a stylish machine with a Cyrix 486SLC/25 processor and 87SLC math coprocessor; a 120MB hard drive; a modem that provides 9,600-bit-per-second fax send, 4,800-bps fax receive, and 2,400-bps data-transmission capabilities; and an external trackball. The Avanti's unique screen-hinge design is also a boon on an airplane, because you can tilt the screen back easily, even in cramped quarters.

The Avanti's durability has increased significantly since we tested this model for last June's *PC/Computing* 200. The unit made it all the way to the tumble test, where its thin sheath-type carrying case failed to protect its backlight from an untimely blowout. BCC sells an extra-cost carrying case (part number 000-0035-01) for

BCC Avanti 486

$49.95, and though we don't know if this might have prevented the Avanti's knockout in the tumble test, it's a sure bet that you're better off with the padded case.

The Avanti's two biggest shortcomings are its slow-as-molasses hard drive and its 2.75-inch rear-case height, which is the price you pay for the neat midhinge design. The front of the case is a full inch lower than the back, but the overall height still takes up a lot of space in a brief case. This detail, combined with the more-than-6.5-pound heft, gives this model a poor portability rating.

Aside from the slow hard disk, the Avanti's performance is average among the tested models, a good showing for the Cyrix chip. Its battery life, however, which is less than two and a half hours with power-management features in effect, is substandard.

The Avanti's CPU is not upgradable, but a 200MB hard drive is available, and you can tack on an Ethernet adapter as an option. Bundled software includes DOS 5.0, Windows 3.1, Terminal Plus, WinFax 2.0, and Magic Cursor—it's perhaps the best bundle of the group and another value-adding feature. The Avanti is also available in a passive-matrix color version. The model we tested didn't provide simultaneous display of the LCD and an external CRT VGA monitor, but according to manufacturer BCC, this capability was being added at no extra cost at press time.

Gateway Nomad 420SXL

IN BRIEF: Highly portable and easy to customize, the Nomad's middling performance keeps it from earning a top spot.
PROS: Extremely portable; effective power management.
CONS: Sluggish disk and CPU; poor keyboard; not very durable.

- $1,995
- Gateway 2000
- 610 Gateway Dr.
- North Sioux City, SD 57049
- (800) 523-2000, (605) 232-2000

AUTOMAKERS CLAIM THAT cars built on Tuesdays or Wednesdays are more reliable than cars built on Mondays or Fridays. Apparently, it's related to the factory workers' outlook. Maybe such a theory would explain why two notebooks of similar design respond differently to torture. Although we can guarantee that both units were treated equally miserably, the Gateway Nomad outperformed the virtually identical Texas Instruments TravelMate 4000 in our durability tests. When the smoke cleared, the Nomad had made it three tests past the TravelMate, ailing as it went. It finally, dramatically turned belly-up in the severe-drop test, earning just an average rating for durability.

Like the TI, the Nomad ranks with the Tandy and Twinhead at the top in our portability ratings, which consider case dimensions, overall weight, and ease of use on the road. Some minor design features—like flimsy plastic port covers and a parallel port with an unconventional orientation—can be annoying, but the highly customizable CMOS BIOS settings, excellent Windows power-management features, and other extras make this model a dream to tote around. A Windows Control Panel icon (available on both the Gateway and TI) that provides access to a broad range of notebook-oriented settings is perhaps our favorite feature. Every notebook should be this easy to customize.

Had the Nomad performed better, it might have challenged the TI notebook for honorable-mention status. Unfortunately, its hard drive is a real dawdler, and its 486SX/20 CPU didn't measure up. Battery life is another weak point: In the straight battery-drain tests, the Nomad lasted only 1 hour and 34 minutes, the shortest time of the group. With power-management features enabled, however, it showed the most dramatic boost of the lot, lasting about 2 hours and 44 minutes.

Like Texas Instruments' TravelMate, the Nomad also falls down in the areas of keyboard and display. Although the feel of the keyboard is fine, key placement and function-key requirements leave much to be desired. And while the Gateway and TI models have the largest screens of the notebooks we reviewed—measuring a full 10 inches diagonally—the displays appeared somewhat washed out. We preferred the slightly brighter 9.5-inch screens on the ALR, BCC, Tandy, Toshiba, and Twinhead notebooks.

If you like the Nomad's design, we suggest you look instead to TI's better-performing TravelMate 4000 WinSX/25, which provides an SX/25 processor and a 120MB drive for $800 more. Or spring the extra $700 for Gateway's Nomad 425DXL, which comes with a 120MB hard drive. As it stands, this Nomad's overall value is at the low end of average.

Gateway Nomad 420SXL

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Grid 1755/486SLC

Grid 1755/486SLC

IN BRIEF: The Grid 1755 is one tough customer, but you might not want to pay for it—or use it—due to its poor performance.
PROS: Extremely durable; effective power management.
CONS: Dismal performance; poor display; expensive.

- $2,990
- Grid Systems Corp.
- 47211 Lakeview Blvd.
- P.O. Box 5003
- Fremont, CA 94537
- (800) 222-4743, (510) 656-4700

AT JUST UNDER 6.5 pounds and at only 1.75 inches high, the Grid 1755/486SLC deserves praise for being durable without being a total Goliath. And its 12-by-10-inch dimensions, somewhere between legal and letter size, allow for a very large, well-designed keyboard.

Among our durability winners, the midhinged Grid ranked last, since the severe-drop test yanked its lid-hinge mounting screws from their sockets on one side. Because the screws popped right back in place and no outward damage or loss of functionality resulted, the Grid passed, but just barely. Some minor repairs would probably be in order.

The Grid's drawbacks outweigh its durability, though. First, it was the slowest performing unit overall. Its Cyrix 486SLC/20 processor just couldn't keep up with any of the other models tested, and its hard drive was very slow. The Grid also suffers from having one of the smallest displays of the bunch—a shortcoming compounded by the display's unconventional switch, a three-position slider affair that works more like a clock radio's dimmer/brightness switch than an analog display control. In practice, this isn't a major problem, since contrast is more important to optimizing monochrome LCD display quality. Still, we'd prefer to have a continuous range of brightness levels.

If those drawbacks weren't enough to remove the Grid from consideration, the price tag would be. At $2,990 with 4MB of RAM, it's the second-most-expensive notebook we tested. In light of its poor performance and limited display, the Grid's overall value hits the skids. While other models from Grid are worth considering, cross this one off your list.

PC Brand 486/SLC

IN BRIEF: Steer clear. Despite a great price and a fast hard drive, this poorly designed model disappoints in other areas.
PROS: Inexpensive; great hard drive performance.
CONS: Very short battery life; small display; slow video.

- $1,945
- PC Brand
- 405 Science Dr.
- Moorpark, CA 93021
- (800) 722-7263, (805) 378-7848

THE FIRST THING you should know about the 486/SLC is that you shouldn't buy it in this configuration. For $200 more, you can get it with a 120MB hard drive—a much better value. The 486/SLC was also going through a minor revision at press time. The new version of the product (unnamed at press time) will have a couple of new features, including an internal trackball and two batteries instead of one. By and large, PC Brand says, it will be the same notebook PC, but the tweaks should make it a better value.

It's wise to watch and wait, because even at just $1,945, the 486/SLC isn't much of a deal. For the most part, the notebook's Cyrix 486SLC/25 chip stacked up OK against the 486SX/20 models in this review and turned in average times, and its hard drive was among the fastest in the group. It fell down in video performance, however, and its display size and quality are inferior. It also took a major hit in battery-charge life, turning in the shortest times of the group.

PC Brand's strategy in notebook-case design—which

PC Brand 486/SLC

we think heads in the wrong direction—is to maintain its 11-by-8.65-inch length and width and increase the notebook's height to 2.25 inches. The extra height might not seem like much, but it adds considerable bulk to the machine, especially compared to 1.75-inch and shorter machines like the Grid, Tandy, and Twinhead. And at nearly 7 pounds, the unit doesn't win any points for portability, either.

The 486/SLC placed on the low side of average in the durability arena, too. It made it to the severe-drop test, which resulted in serious BIOS error messages and an inability to read or write to its floppy drive—this occurred after it had encountered difficulties, usually temporary ones, in nearly every trial along the way. The basic-drop test sank the left side of the keyboard about three-eighths of an inch into the case, but the unit continued to work.

Buy the PC Brand 486/SLC if you want something faster than a 386 notebook at a very cheap price and you're unconcerned about little "amenities" like battery life, video performance, and display quality. Otherwise, steer clear.

Tandy 4800 HD

IN BRIEF: The Tandy 4800 HD's smart design and great portability rating can't make up for its limited hard drive configuration.

PROS: Extremely durable and portable.

CONS: 60MB hard drive only; slow CPU.

- $2,499
- Tandy Corp.
- 1800 One Tandy Center
- Fort Worth, TX 76102
- (817) 390-3011

IF YOU'RE GETTING the idea that a notebook PC must be big and ugly to be durable, think again. The Tandy 4800 HD's small size and light weight placed it among the four most portable machines, yet it still managed to ace the durability tests. The 4800 HD did require a trip to the "spa"—our euphemism for a quick bake under the oven's heat lamps—to freshen up after the coffee-spill test, but it emerged none the worse for the wear.

The Tandy machine did well in the lethal coffee-spill test because of its smart design. Like some other newer notebook keyboards—including the Twinhead's—the

IS YOUR NOTEBOOK TOUGH ENOUGH?

A blow-by-blow account of *PC/Computing*'s exclusive real-world torture tests.

It may sound like *PC/Computing*'s editors have a great time performing durability tests, but turning real-world disasters into scientifically comparable tests is hard work. Each trial must mete out precisely the same degree of punishment to each notebook, must be measurable, and must be repeatable. As far as we know, no one else is doing this sort of notebook testing—yet.

Our challenge was to design tests that deliver a sensible and fair amount of abuse. While some of our tests bear little resemblance to the real dangers to which your notebook might be exposed, each one correlates to a specific real-world hazard. The problem of degree is compounded by the fact that notebook manufacturers are getting better at what they do. That's why we slightly increased the force and duration of the tests this year, and probably will again next year.

Of course, the *truly* appropriate methodology would dictate the use of a brand-new notebook for each trial. Currently, however, we're limited to one unit from each manufacturer for all the tests. We therefore scheduled the tests to reduce the effect of cumulative damage. While that possibility nonetheless remains, our experience shows that it is less of a problem than it might seem. A more relevant possibility is that a product could fail to a specific hazard early on and not get a chance to prove itself in the other tests. But until we persuade each manufacturer to send us a half-dozen notebooks . . .

The rules of the game were simple. In general, any damage that reduced basic functionality of the notebook, seriously affected the appearance of the unit, or would require repair for the unit to function normally counted as a failure. One strike and you're out. Because not every negative effect is visible, we began by running a series of benchmark tests on the various subcomponents of the system. In particular, we looked for CPU, memory, and hard drive integrity and performance, since those are the areas most commonly affected in our disaster scenarios. After each trial, we tested the machines again, noting any deleterious results. Hard drive performance losses were allowed to pass for the most part, although a machine that survived all the tests might have been knocked out at the end if its hard drive performance were drastically reduced.

Here's what our contenders faced this year:

Freezer Burn

Leave a six-pack of soda in the trunk of your car on a frigid winter night, and in the morning it's mess *du jour*. Notebook PCs don't explode in your car trunk, but if you leave one out in the cold long enough, the battery fades and

Tandy 4800 HD

Tandy keyboard has a plastic pan underneath. The keyswitches protrude through this tray, but they're surrounded by sealed bezels that keep spilled liquid from sloshing over the sides. The keyboard is aesthetically pleasing, too, with its circa-1981 computer look. The keys even have the slightly springy feel reminiscent of that era. Overall, we liked this keyboard, along with the ALR Ranger keyboard, the best of the bunch, although some of the Tandy's keys are on the small side.

At $2,499, the 4800 HD is priced right, but you can get a better price/performance deal. Its CPU times lagged in our tests. Worse, it's available with only a 60MB hard drive, which is just barely acceptable for running Windows and a few Windows apps. Battery times, on the other hand, were quite good for the Tandy, which has a small, modular battery and a small, well-designed case. With power-management features on, the battery lasted just over three hours in our tests, about a half-hour longer than the Best Value Twinhead with its more powerful—and power hungry—486SX/25 processor.

The Tandy is one of the few models we tested with an optional internal trackball. This particular design isn't our favorite, but when you need to load a Windows app to check something quickly—say, in a meeting—it's nice not to have to haul out a mouse and plug it in.

If you're a Tandy loyalist, you'll probably think this

the hard drive gets sluggish. Oddly, the greatest danger actually lies in turning on the notebook while the drive is still frozen. The machine's drive heads are stiff, but when electricity coils, the heads do their best to move, sometimes obliterating data and causing excessive wear and tear on internal components in the process.

In our freeze test, we piled the notebook PCs into an upright freezer with a stabilized temperature of 10 degrees Fahrenheit and we left them there overnight (for a total of 10 hours). In the morning, we took them out, plugged them in, and allowed them 30 minutes to warm up before we tested them. (If your notebook freezes, however, you should give it a couple of hours to thaw before plugging it in and flipping the switch.) Most of the notebooks suffered minor, temporary lapses in hard drive and LCD screen performance, but they all stood up to the rigors of the cold.

Hot and Bothered

The heat test simulated the effects of leaving a notebook in a car parked in the sun on a hot summer day. Research shows that temperatures under these conditions can reach up to 185 degrees Fahrenheit. Not satisfied with last year's oven test, which subjected the notebooks to only 130-degree temperatures, we constructed a new oven that boosted temperature and improved test safety.

Six 150-watt bulbs, spaced evenly along the bottom of a refrigerator carton laid on its side and lined with aluminium foil, provided the heat. But because last year's oven inadvertently dropped a unit, we designed a secure notebook rack whose aluminum screening also helped radiate the heat evenly. To keep the temperature high, we installed rheostats for controlling light-bulb brightness, and we sealed the box to reduce heat-dissipating air exchange. The result was a 25-degree jump in temperature, to 155 degrees Fahrenheit. Finally, we stretched the duration of the test from six hours to eight. We removed the notebooks and placed them back at the test bench, giving them an hour to cool off before testing.

Although we'd upped the ante, the notebooks sustained no permanent damage. The heat-radiation measures worked quite well, and there were only two barely perceptible instances of cases melting. Look for things to get even hotter next year.

All Shook Up

The basic goal of the vibration test was to rattle the insides of the notebooks, not the outsides. Any motion of the notebook within the jaws of the mixer and any undue inward pressure applied to the (*continued on page 142*)

Configuration pictured

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80MB hard drive
2MB RAM
PS/2® 8511–VGA
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8MB RAM
PS/ValuePoint 6312–SVGA NI
5 slots, 5 bays & mouse
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$2,199* 212MB

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PS/ValuePoint 6312–SVGA NI
5 slots, 5 bays & mouse
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notebook is the best the company has ever sold. Next time you drop by a Radio Shack, make sure to chastise them for not offering the 4800 HD (or the more powerful 486DX/33 4860) in 80MB or 120MB configurations.

TI TravelMate 4000

IN BRIEF: The venerable TravelMate 4000 is still a good value, but it could use durability, keyboard, and screen improvements.
PROS: Extremely portable; top overall performer.
CONS: Not durable; battery life acceptable but shorter than most.

- $2,799 (with a 120MB drive standard)
- Texas Instruments
- Information Technology Group
- P.O. Box 202230
- Austin, TX 78720
- (800) 527-3500

WHEN IT WAS introduced, the TI TravelMate 2000 was quite simply a marvel—small, light, and very usable. Texas Instruments has done a lot of cosmetic surgery over the years to help this now-venerable notebook PC keep pace with portable power.

TI TravelMate 4000

And even though the design is beginning to show some signs of age, the TI TravelMate 4000 WinSX/25—at $2,799 with a standard 120MB hard drive—is still a great value. And as far as performance goes, there are no flies

IS YOUR NOTEBOOK TOUGH ENOUGH? (continued)

notebook by the mixer jaws constituted test—not notebook—failure. Last year's method of strapping notebooks to the mixer jaws was successful only because of the diligent test crew, which made sure each notebook was securely lashed in place and that the mixer jaws weren't too tight.

Because last year's process introduced too many possibilities for test error, this year we devised a custom-built notebook-restraining box for the Red Devil that allowed us to clamp

down the mixer jaws as hard as we wanted without applying any pressure to the notebook. (This device also increased test safety; during the calibration phase last year, we nearly lost several staffers to flying notebooks.) The inside of our box was lined with high-density foam to cushion and firmly grip the notebooks. A second, inner floor of the box could be adjusted upward in fine increments to hold the notebooks snugly in place.

Last year's vibration test knocked out only one contender, so this time around we boosted the shake, rattle, and roll from 10 to 15 minutes. Even so, the shake test again claimed only one victim.

Pouring It On

Last year we spilled about 8 milliliters of a coffee/water solution on the notebooks. This year, however, we used the coffee we like to drink ourselves (it's just a tad stronger), and we dumped 10 ml of the solution (which is a more significant increase than you might think) into the center of each notebook's keyboard. We even wiped any liquid caught by the tops of the keycaps over their sides. After 30 seconds, we dried out the machines as best we could, using heat blowers, hair driers, and towels. If necessary, we pulled off the key caps, removed batteries, and did everything we could to dry them without splitting open their cases. Once the units were as dry as possible (usually after about 10 minutes), we switched them on.

Last year, the heat test followed the spill test, and because it proved beneficial in some instances by drying out sticky keys and restoring the hard drive performance, this year we instituted a 2-hour trip to the oven as part of the restoration procedure. The spa treatment actually revived four contestants that might otherwise have failed and temporarily or permanently impaired the performance of a few hard drives and even one machine's CPU. This doesn't mean, however, that if you spill something on your notebook

keyboard you should pop it into your kitchen oven. (*continued on page 144*)

New!

2 out of 3 users prefer Quattro Pro for Windows

An independent study proves it

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NEW! Database Desktop™ gives you the easiest way yet to get Paradox® and dBASE® data into your spreadsheet.

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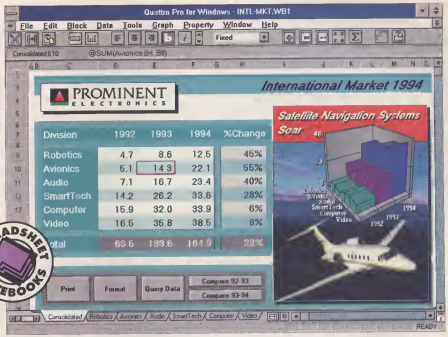

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on it, either. The WinSX/25 is the fastest model of this group, hands down.

In the area of portability, the TravelMate still provides market-leading small size and weight in a full-featured notebook, even two years after its introduction. The durability of the TravelMate's design, however, has become an issue. Notebooks have gotten tougher over the years, and the rigor of our durability testing has increased accordingly, while the TI design remains basically unchanged. Last year's vibration test was the same as this year's in most respects (we even used the same paint-can shaker), but we shook the notebooks 5 minutes longer. Those extra minutes did in the TI. That's when it conked out.

There are other problems, too. The keyboard design has never been a strong point, because it uses function keys for Page Up, Page Down, Home, and End when real estate is going to waste. While the 10-inch monochrome display is still one of the largest you'll find, it looks washed out. And with all the great power-management software that comes with the WinSX models, it was surprising to see the TravelMate come in at only a little over two and a half hours with power saving enabled. The Gateway Nomad 420SXL, which is practically a clone of this notebook, showed greater power-management improvement. (Its raw battery run-down time was shorter, though, so the end result is about the same. Go figure.) An important difference between these models is that the Gateway is a 486SX/20, while the TI is a faster 486SX/25. Still, we had expected more from Texas Instruments.

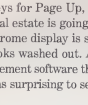
On the bright side, the TravelMate comes with an external trackball and a variety of options, including network adapters and a SCSI port. For those who yearn for a color screen, TI was about to make a passive-matrix color display version available at press time. The company was also about to announce a DX2/50 version of the TravelMate 4000.

For performance, portability, and value, the TI TravelMate is the only notebook we tested that seriously competes with the Best Value Twinhead Slimnote. Depending on your needs, these virtues may or may not make up for dismal durability and a less-than-perfect keyboard.

IS YOUR NOTEBOOK TOUGH ENOUGH? (continued)

Plop, Plop . . .

The basic-drop test was very simple to perform, and most notebooks passed it



readily—but don't try it at home. We held each notebook PC at desk height, 29 inches above the floor, oriented as if it were sitting on a desk, with its lid closed and the power off. Then we released the machines quickly and evenly so that they fell flat on their bottoms.

The floor was low-pile industrial-grade carpet over concrete, the type common to office buildings. The most common negative effect was a blown LCD backlight. While repairing this malady is usually inexpensive, it's a sign of a poorly constructed notebook.

Gravity Has Its Way

For the severe-drop test, we inched the notebooks off the top of a desk 29 inches high and allowed gravity to pluck them from the edge. This test is a real killer because the machines fall with the power on, drives booted to the C: prompt, and LCD screens open 130 degrees or to their maximums. For this drop test, we removed the carpeting from our concrete floor and replaced it with a thin sheet of cardboard to reduce abrasions.

To make matters even worse, we repeated the severe-drop test three times—once backward and twice forward (that's one more forward drop than we performed last year)—and it turned out that the third drop did the most damage to the notebooks. Notebook PCs with clamshell-hinge designs and displays that can open a full 180 degrees have an

advantage in this test, since their hinges endure for more stress.

'Round the Bend

Remember the Samsonite gorilla commercials? To simulate a bad day in baggage handling, we padded the inside of an ordinary clothes dryer with carpeting and set the machine to air fluff (no heat). Then we gave each machine an 8-minute spin. The sounds were ominous, but the overall damage was less severe than we expected. The most common results were blown backlights and a few fairly significant case cracks or abrasions. Only two machines fell to the tumble.

We'd asked manufacturers to send their most protective cases. A couple, however, arrived with what amounted to nothing more than slipcovers—thin, sheath-type cases that afford almost no protection. The tumble test proved what common sense suggests: Buy the most protective case you can find.

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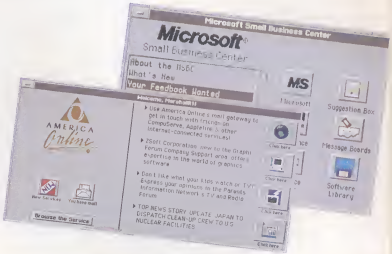

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Plop, Plop . . .

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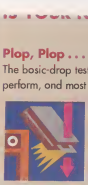

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SURVIVAL OF THE FITTEST

How did ten 486 notebooks withstand the chills, spills, and five other torture tests in our little shop of horrors? Some survived, some needed help along the way, and some expired quickly.

	Freeze	Heat	Vibration
Texas Instruments TravelMate 4000 WinSX/25		Battery required five hours cool-down before the machine would boot on battery. Battery also had to be removed and reseated. A slight ripple appeared on top of the case.	Wouldn't boot from the floppy drive. CMOS setup error message. Small pieces were heard rattling around inside the case.
ALR Ranger M486SX/25			
Toshiba T4400SX			A slight crack appeared where the back of the case meets the lid hinge.
Wyse DecisionMate 486SLC			CPU performance increased significantly after this test and stayed that way
Gateway Nomad 4205XL		Battery became very hot and had to be removed and reseated before machine would boot on battery. A slight ripple appeared on top of case.	Hard drive performance slowed. There was a temporary, intermittent floppy boot problem. Pieces were heard rattling around inside the case.
PC Brand 486/SLC		Hard drive performance slowed temporarily.	Hard drive performance temporarily improved.
BCC Avanti 486	Hard drive performance slowed to a crawl, a common but temporary effect that lasted longer on the BCC.	Hard drive performance temporarily increased.	Hard drive performance eroded by a small margin.
Twinhead Slimnote 4SX/25			
Grid 1755/486SLC			
Tandy 4800 HD	Temporary difficulty running software, although it booted fine.		

Spill	Basic Drop	Severe Drop	Tumble

Problem encountered at this test.

Notebook failed at this test.

Durability survivor passed all tests.

Wouldn't turn off. Many keys responded incorrectly. Dry-out treatment attempted, but didn't help.

The keyboard stopped functioning properly. Didn't respond to dry-out treatment.

The backlight blew out.

Received "Keyboard Stuck" error message. Three keys had intermittent problems that cleared up later. Required dry-out.

Backlight blew out, and the machine wouldn't boot from its hard disk.

Wouldn't boot at first, and screen wouldn't light. Received "Keyboard Stuck" error message. Many keys wouldn't work. Problems cleared up after dry-out.

Hard drive performance temporarily slowed. Left side of keyboard sank into case, but the notebook still worked.

CMOS settings were permanently affected, generating an error message. Wouldn't boot from the floppy drive.

Slow to boot, then crashed. Hard drive slowed further. Eventually boated, and keys worked properly. Required dry-out treatment, which worked.

Hard drive performance slowed further still.

Hard drive performance improved slightly. A crack appeared in the case above the floppy drive. The space bar was temporarily disabled.

Backlight blew out, and the crack above the floppy drive grew markedly.

Temporary loss of hard drive performance.

The backlight blew out, and the case received significant abrasions.

Right-side screen-mount screws pulled away from case, but they popped back in place with no visible trace.

Required dry-out for sticky keyswitches, but then worked fine.

DURABILITY SURVIVORS

Toshiba T4400SX

Toshiba T4400SX

IN BRIEF: Well-designed notebook in many respects, but drawbacks may outweigh the benefits.

PROS: Upgradable CPU; great battery life; great CPU, memory, and video performance.

CONS: Poor portability and durability; slow disk; expensive.

- $3,798 (as tested with 6MB of RAM; $3,698 with 4MB)
- Toshiba America Information Systems
- Computer Systems Division
- 9740 Irvine Blvd.
- Irvine, CA 92718
- (800) 334-3445, (714) 583-3000

TOSHIBA HAS LONG been a dominant notebook manufacturer, but when an industry moves at breakneck speed, it's hard for any one player to maintain the technological lead. If you want a brand name 486 notebook, it isn't a bad choice, but if you're comparing features, performance, durability, and price, the Toshiba comes up short.

The T4400SX's CPU is upgradable to a 486DX/25, and the machine boasts exceptional battery life—the best in its class. Other attractions include a well-designed keyboard with large keycaps; a large, bright display; and excellent CPU, memory, and video performance. Those are all commendable features, and taken as a whole, you may wonder what's not to like.

Well, let's begin with the 7.25-pound weight and large dimensions—the price you pay for the amazing battery life (the battery is about a pound heavier than the average notebook battery)—and the large keyboard. And though this model is beefy enough take most punishment with ease, it isn't immune to the dreaded coffee spill. But if you're not the type to spill coffee or soda on a keyboard, you can probably expect the Toshiba to be fairly durable. Another disappointment was the notebook's slow hard drive, which contrasted with its good performance in other areas.

There's another very serious problem with the Toshiba that wasn't engineered in—the price. Considering its portability, drive performance, troubles with the coffee spill, and the alternatives, you might not want to pay $3,698 for a 4MB/80MB model. Unless you absolutely need long battery life or a large keyboard, you can find a better value at a lower price.

BEST VALUE

Twinhead Slimnote 4SX/25

IN BRIEF: A true Best Value, the Slimnote combines durability, portability, solid performance, and upgradability for a reasonable price.

PROS: Very durable; extremely portable; solid performance.

CONS: Battery life is acceptable, but shorter than most.

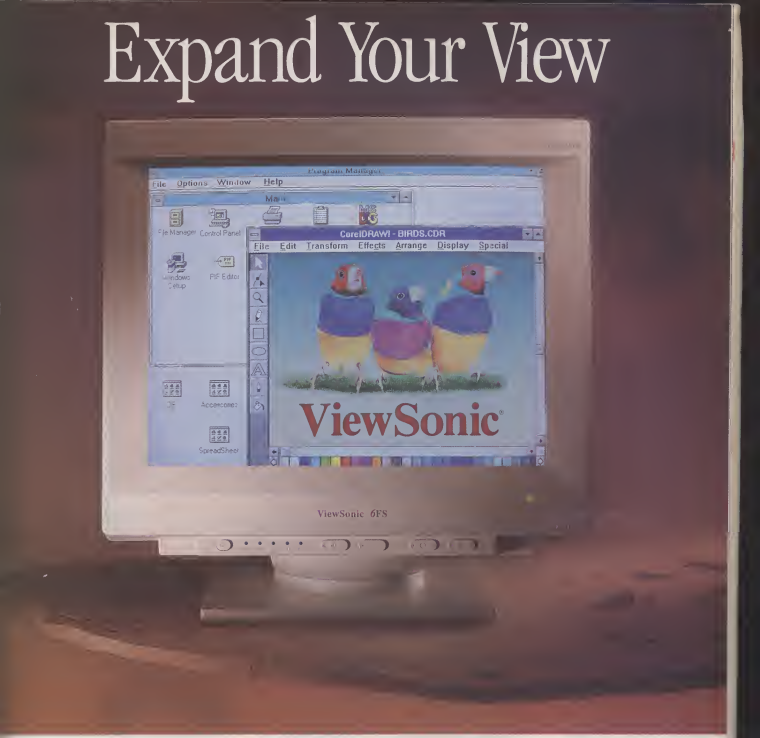
- $2,275 (as tested with a 120MB hard drive; $2,085 with an 80MB drive)
- Twinhead Corp.
- 1537 Centre Pointe Dr.
- Milpitas, CA 95035
- (800) 995-8946, (408) 945-0808

THE TWINHEAD SLIMNOTE 4SX/25 makes all the right compromises. It isn't the fastest or the most durable, it didn't have the longest running battery or the lowest price, and it wasn't the smallest or lightest notebook, but it came close in all but one of those areas, making it the best all-around notebook we've tested—maybe ever—and our Best Value.

Along with the Gateway, TI, and Tandy units, the Twinhead ties for best in portability. Add a healthy dose of stamina in the durability department for the Tandy and the Twinhead, and you've got a near-perfect combination of grace and brawn. What happened to the Twinhead under physical duress? It's an interesting story. The Twinhead actually performed slightly better in the torture tests (just a minor hiccup after the coffee spill) than the similarly designed Tandy. But when push came to shove in the tumble (*continued on page 165*)

Twinhead Slimnote 4SX/25

Expand Your View



Yes, it's definitely time you expanded your view to the non-interlaced 15" ViewSonic 6FS monitor.

For one thing, you get 36-percent more viewing space than with a standard 14" monitor. And, since you can display more information on the screen with the larger 15" flat square screen, this is an ideal monitor for Windows, Graphical User Interface (GUI) and desktop publishing environments.

Thanks to the ultra high 72Hz refresh rate with resolution up to 1,024 x 768, the ViewSonic 6FS produces the most vivid and precise **flicker-free** image anywhere. In addition, the non-glare screen reduces irritating reflections.

The monitor, compatible with all standard resolutions, features 32 programmable modes with digital controls to store and customize the display to fit your specific needs. It also is certified to meet strict MPR-II Swedish certifications for low emissions, which makes it environmentally safe. It's a fact– the ViewSonic 6FS offers special features normally available only on larger, more expensive monitors.

Expand your view, not your budget, with the affordable 15" ViewSonic 6FS monitor.

ViewSonic®

20480 E. Business Parkway
Walnut, CA 91789
(714) 869-7976 (800) 888-8583 Fax: (714) 869-7958

For immediate faxed information, call the FaxSonic "hot line" at (714) 869-7318–it's available 24 hours a day.

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November 1992
"...can mean the difference between a completed presentation and a nervous breakdown."

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June 1992
"The best product (we've reviewed) for quickly knocking out impressive presentations."

Computer Reseller News Editors' Choice

May 1992
"...excelled in overall performance and ease of use."

PC WORLD BEST BUY

November 1992
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Lotus Freelance Graphics for Windows

*Offer valid in U.S. only. In Canada call **1-800-GO-LOTUS**. ©1992 Lotus Development Corporation, 55 Cambridge Parkway, Cambridge, MA 02142. All rights reserved. Lotus and Freelance Graphics are registered trademarks of Lotus Development Corporation. Windows is a trademark of Microsoft Corporation.

NEW 486 CHIPS, FASTER NOTEBOOKS JUST AROUND THE CORNER

Na sooner had aur durability team started ta wark than rumars af a whale new crap af 486 notebaaks began. We knew Intel's new 486SL/25 CPU was caming, but we weren't sure when. The largest maker af PC micraprassors has stepped up its pramatian af 486 chips in an effort ta recapture the mar-ket share fram clone makers' 386s.

INTEL FIRES FIRST Released this fall, Intel's new 486SL/25 notebaak micra-prassar is intriguing far several rea-sans. Like the 386SL/25, it incarparates hardware support far several advanced pawer-management functians. Unlike the 386SL, however, it is a full-blown 486DX implementatian that pravides a CPU RAM coche and an integral math capracessor in addition ta the standard 486 instructian set designed ta suppart 32-bit saftware.

Another difference is apt ta have less effect on notebooks now than in the lang run: The 486SL/25 can run at both 3.3 and 5 valts. Mast desktap and notebook PCs run at 5 valts, an industry standard. But a notebook whase internal campanents wark at 3.3 volts spares battery-charge life and runs coaler. Al-thaugh AMD and Cyrix have affered 3.3-valt CPUs for same time, very few 3.3-valt internal peripherals are in use. With notebaak designers shifting to 32-bit 486s, manufacturers have been waiting far Intel ta take the lead. Naw that it has, the praspects are gaad far full 3.3-valt natebaak implementatians in the next year.

AST, Campaq, and Zenith are all committed ta releasing natebooks based an the 486SL/25. And severol others are alsa warking an designs based an the new CPU. Zenith's 486SL/25 model is expected ta be annanced in Janu-ary, and the Compoq LTE Lite 4/25C and AST PowerExec should be avoilable by the time you read this.

The passibility af getting even greater notebook power withaut seriausly sacri-ficing battery-chorge life is laaking brighter, too. Intel is plonning to release a 33MHz version af the 486SL chip, prabably by this spring. The cam-pany is alsa at work on additianol baosts in performance, which could take the farm af either o clock-doubled 486SL chip or o higher clock-speed version—or bath.

The news fram Intel isn't all good, however: The cam-pany's 486SL/25 wan't be manu-foctured in large quantities right away. That's why Com-poq has chasen ta limit the chip ta its more expensive, ocitve-matrix display model. With quantities limited, you can expect 486SL/25 notebook prices to be much higher than 486DX/25 notebook prices. The average 486DX/25 nate-baak was selling far $3,000 or less at press time. You con expect 486SL/25 list prices ta start at $3,500 or higher.

Compaq 4/25C

CYRIX FIGHTS BACK Nat ta be autdane in the notebook CPU market-ploce, Cyrix has a few tricks up its sleeve, tao. The Cyrix 3.3-valt 16-bit 486SLC/25, used by three of the mo-chines in aur review, is actually de-signed ta be o high-end 386 upgrade rather than a 486.

Cyrix's new 32-bit chips, designed ta be pin compotible with Intel's 486SX and 486DX chips, ore more pramising. These CPUs pravide pawer-manage-ment features similar ta Intel's SLs. They'll be affered as clock-doubled 50MHz CPUs, and passibly in a clock-doubled 66MHz version. As an added power-saving feature, Cyrix is design-ing its new chips with adjustable clock speeds, sa they con pawer up ond dawn automatically on demond.

While same notebook manufacturers ore pushing ohead with 486 designs, others ore toking o wait-and-see ap-prooch. In the interim, many are re-leasing notebaaks using Intel's 486SX and 486DX chips. Toshiba's new T4500 series af manachrome and thin-film transistar (TFT) active-matrix note-baaks is a gaad example. The praduct line blends the weight advantages af Tashiba's T2200SX with the campany's powerful but heavy T4400 line. The T4500 is o new 6-pound, 1.8-by-11.7-by-8.3-inch design pawered by Intel's 3.3-valt 20MHz 486SXLP chip. It's also avoilable with Toshiba's stellar 8.4-inch TFT ocitve-matrix calar display. The campany has revamped its T4400SXC by swapping o larger, 9.5-inch TFT color screen for the 8.5-inch display, making it one af the first competitors to IBM's $4,350 ThinkPad 700C with its gigantic 10.4-inch TFT calar screen.

A new crop of 486 processors promises greater notebook PC power without compromising battery-charge life.

486 NOTEBOOK TORTURE TEST Features and Ratings

	ALR Ranger M486SX/25	BCC Avanti 486
Price at tested configuration[1]	$2,595	$2,795
SPECIFICATIONS[2]		
CPU type/cache RAM size	Intel 25MHz 486SX/8K	Cyrix 25MHz 486SLC/1K
CPU upgradable/type	Yes/25MHz 486DX and 50MHz DX2	No
RAM—tested/maximum	4MB/16MB	4MB/8MB
Hard disk capacity—tested/maximum	80MB/210MB	120MB/200MB
Hard disk manufacturer	Western Digital	Toshiba
Tested average access time	12ms	17ms
Overall size in inches (height by width by depth)	2.25 by 11.75 by 8.5	2.75 by 11.13 by 8.62
Overall weight in pounds (with battery and modem)	7.48	6.58
Battery type/weight in pounds	NiCad/1.82	NiCad/1.18
Battery drain without power management (hours:minutes)	2:22	1:52
Battery drain with power management (hours:minutes)	2:48	2:18
Display size (inches diagonal)	9.0	9.5
Color version available/type	Yes/passive and active matrix	Yes/passive matrix
Simultaneous LCD and external CRT display	No	No
LCD hinge type/maximum degrees that lid can open	Clamshell/180	Midhinge/130
Ports	One each serial, parallel, mouse, external VGA, external keyboard or keypad, and expansion bus	One each serial, parallel, mouse/keyboard, external VGA
Notable features and options	Integral carry handle, trackball mount; optional docking station and Ethernet, SCSI, and fax/modem ports	Cx87SLC math coprocessor, 120MB hard drive, fax/modem and external trackball come standard; unique screen hinge; Ethernet option
Bundled software	DOS 5.0, proprietary power management	DOS 5.0, Windows 3.1, Terminal Plus, WinFax 2.0, Magic Cursor
BENCHMARK RATINGS		
CPU[3]	2	3
Memory	2	3
Video	3	3
Disk	3	5
Applied battery life	2	4
EDITORS' RATINGS		
Durability	4	2
Portability	5	4
Monochrome display quality	2	2
Keyboard layout and feel	1	3
Warranty and support	1	1
OVERALL VALUE	2	2
	Sturdy, powerful, and upgradable, to boot.	The choice notebook for frequent fliers.

	DURABILITY SURVIVOR	
Gateway 2000 Nomad 4205XL	**Grid 1755/486SLC**	**PC Brand 486/SLC**
$1,995	$2,990	$1,945
Intel 20MHz 486SX/8K	Cyrix 20MHz 486SLC/1K	Cyrix 25MHz 486SLC/1K
No	No	No
4MB/8MB	4MB/8MB	4MB/16MB
80MB/80MB	80MB/80MB	80MB/120MB
Seagate	Conner	Seagate
19ms	19ms	17ms
1.8 by 11 by 8.5	1.75 by 12.2 by 10	2.25 by 11 by 8.65
5.88	6.46	6.96
NiCad/1.34	NiCad/0.8	NiCad/1.36
1:34	1:54	1:35
2:44	2:49	2:01
10	8.5	9.0
No	No	Yes/passive matrix
Yes	No	Yes
Clamshell/120	Midhinge/135	Clamshell/130
One each serial, parallel, external VGA, mouse/keyboard, keypad, expansion bus	One each serial, parallel, mouse/keyboard/keypad, external VGA	Two serial; one each parallel, mouse/keyboard, external VGA, expansion bus
External trackball included; optional SCSI, Ethernet, Token Ring ports		Canvas case standard; optional docking station; updated version will offer internal trackball and two batteries
DOS 5.0, Windows 3.1, Works for Windows, proprietary Windows power management	DOS 5.0, proprietary power management	DOS 5.0, Windows 3.1
4	5	3
2	4	3
2	5	4
5	4	2
3	2	5
3	1	3
1	3	3
3	5	4
4	1	3
2	2	2
3	5	3
Great portability offset by disappointing performance.	High price, poor performance outweigh survival skills.	Upcoming version promises new features, better value.

EXCELLENT < 1 2 3 4 5 > DISAPPOINTING

486 NOTEBOOK TORTURE TEST Features and Ratings

	DURABILITY SURVIVOR	
	Tandy 4800 HD	**Texas Instruments TravelMate 4000 WinSX/25**
Price of tested configuration[1]	$2,499	$2,799
SPECIFICATIONS[2]		
CPU type/cache RAM size	Intel 20MHz 486SX/8K	Intel 25MHz 486SX/8K
CPU upgradable/type	No	No
RAM—tested/maximum	4MB/20MB	4MB/20MB
Hard disk capacity—tested/maximum	60MB/60MB	120MB/200MB
Hard disk manufacturer	Western Digital	Seagate
Tested average access time	19ms	17ms
Overall size in inches (height by width by depth)	1.75 by 11 by 8.65	1.8 by 11 by 8.5
Overall weight in pounds (with battery and modem)	5.96	5.6
Battery type/weight in pounds	NiCad/1.32	NiCad/1.32
Battery drain without power management (hours:minutes)	2:22	2:10
Battery drain with power management (hours:minutes)	3:01	2:39
Display size (inches diagonal)	9.5	10
Color version available/type	No	Yes/passive matrix
Simultaneous LCD and external CRT display	Yes	Yes
LCD hinge type/maximum degrees that lid can open	Clamshell/160	Clamshell/120
Ports	One each serial, parallel, mouse/keyboard, external VGA, expansion bus	One each serial, parallel, mouse/keyboard, external VGA, keypad, expansion bus
Notable features and options	Optional internal trackball	A 120MB hard drive comes standard; external trackball included; optional Ethernet, Token Ring, and SCSI ports
Bundled software	DOS 5.0, Windows 3.1, America Online, proprietary power management	DOS 5.0, Windows 3.1, proprietary Windows power management
BENCHMARK RATINGS		
CPU[3]	4	1
Memory	3	1
Video	2	1
Disk	3	2
Applied battery life	3	3
EDITORS' RATINGS		
Durability	1	5
Portability	1	1
Monochrome display quality	2	3
Keyboard layout and feel	1	4
Warranty and support	3	3
OVERALL VALUE	3	2
	Smart design combines durability and portability.	First runner-up, the performance champion.

1 Prices are as of October 15, 1992, and do not include as-tested internal modems

2 All models have monochrome displays, internal 1.44MB 3½-inch floppy drives, and internal modem options (the BCC Avanti 486's modem is standard). As-tested configurations were with 4MB of RAM, an 80MB hard drive, and an internal modem, except where noted. The Wyse DecisionMate 486SLC comes with an external floppy drive, and the company was unable to provide its internal modem in time for testing. The Wyse's overall weight figure includes the external floppy drive, which is heavier than an internal drive, but excludes the very slight weight of the internal modem. Similarly, the Wyse's battery drain number doesn't represent the slight power draw the modem would have caused.

3 These ratings directly compare CPUs of different manufacture and clock speed. Performance of other subsystems may also be affected by processor type. The BCC Avanti 486 is the only model tested that comes standard with a math coprocessor

Toshiba T4400SX	BEST VALUE Twinhead Slimnote 4SX/25	Wyse DecisionMate 486SLC
$3,798 (4MB, $3,698)	$2,275 (80MB, $2,085)	$2,699 (80MB, $2,299)
Intel 25MHz 486SX/8K	Intel 25MHz 486SX/8K	Cyrix 25MHz 486SLC/1K
Yes/25MHz 486DX	Yes/33MHz 486DX	No
6MB/18MB	4MB/20MB	4MB/8MB
80MB/120MB	120MB/120MB	120MB/200MB
Conner	Toshiba	Quantum
19ms	17ms	17ms
2.2 by 11.7 by 8.3	1.6 by 11 by 8.5	1.5 by 11 by 8.6
7.25	6.12	6.22
NiCad/2.4	NiCad / 1.32	NiCad/0.86
4:14	2:04	2:05
4:48	2:33	3:18
9.5	9.5	8.5
Yes/active matrix	Yes/passive and active matrix	No
Yes	Yes	No
Clamshell/180	Clamshell/160	Clamshell/135
One each serial, parallel, mouse, keyboard/keypad, external VGA, expansion bus	One each serial, parallel, mouse/keyboard, external VGA, expansion bus	One each serial, parallel, mouse/keyboard, external VGA, external floppy drive
Optional docking station and 1.8-pound printer	Internal trackball standard; optional docking station	Hardware system lock, leather case standard; optional internal trackball
DOS 5.0, hypertext system help	DOS 5.0A, Windows 3.1	DOS 5.0, Windows 3.1, LapLink with cable, laptop screen-font utility
1	1	4
1	2	5
2	2	4
4	2	1
1	3	2
4	2	4
5	1	2
2	2	4
1	1	4
1	1	1
4	1	3
A solid performer, but the price is just too high.	The best all-around notebook we've tested.	Small and lightweight, but a poor performer overall.

EXCELLENT < 1 2 3 4 5 > DISAPPOINTING

NOTEBOOK BUYER SURVIVAL GUIDE

A blown backlight is the common cold of notebook durability. Like your average light bulb, a backlight may wink out for several reasons, the least controllable of which is a sudden jarring or impact to the case, especially when the notebook is hot. Riding over a New York City pothole or even slamming the lid too quickly could conceivably do a backlight in. Unfortunately, short of buying a model that passed our durability tests, there's no reliable rule of thumb for assessing a notebook PC's predisposition toward a blown backlight.

Our durability tests show, however, that some types of damage can be directly correlated to visible design elements of a notebook PC. A little knowledge and some minor investigative work can go a long way toward helping you choose a more durable model. While there are no guarantees, it pays to be an informed PC consumer. Here are a few features that our torture-test experience taught us to take a hard look at.

• You can pretty accurately gauge the susceptibility of a notebook to damage from liquid by prying off a few of the keycaps. Use a small, flat-headed screwdriver for this purpose. Newer (and better) notebook designs have a plastic tray beneath the keycaps. For each key, a hole in the plastic tray permits access to the keyswitch and the electronics below. In the machines that fared the best in the spill test, there are no other openings in the keyboard pan that would allow fluid to pass through. There's also a raised lip or bezel surrounding the keyswitch hole that prevents fluid from seeping in. The more access there is for fluids, the more likely your notebook will go kaput if you're careless with the Maxwell House.

When a notebook takes a serious nosedive, the most likely cause is the hard drive or LCD screen glass or mounting-hardware failure. You can't predict hard drive reliability in adverse conditions. Since notebook vendors sometimes change hard disk suppliers without warning, your mileage could vary even for the models in our tests. Studying a notebook's screen hinge, bezel, and case construction can help you make a good buying decision.

• Notebooks whose screens flip open 180 degrees to lay flat are less likely to suffer shattered LCDs or broken hinge mountings from a fall. Manufacturers know this, but many continue to design screen hinges that only open 120, 130, or 145 degrees (see the chart "486 Notebook Torture Test: Features and Ratings," page 154, to see how wide screens open on the notebooks we tested). Although our data is less conclusive on this point, midhinged designs, like the BCC Avanti's, seem to offer better viewing in cramped quarters like coach airplane seats but are slightly more susceptible to damage.

• Look at the screen bezel—the molding that goes around the edge of the LCD—too. Protective designs offer strong plastic bezels that, when the lid is open, extend toward you from the screen, a feature that has the added benefit of affording some shading and improves contrast in bright light. Perhaps most important in gauging screen protection is the case area directly behind the LCD, or the top panel of the notebook. With the screen closed, press down on the center of this panel. The most durable designs will have little, if any, give. If your pressure meets with little resistance, don't press too hard—you might crack the screen. On a few of the models we've tested, it wouldn't take much.

• A couple of other design points to consider: Some notebooks, such as the Grid unit, have batteries that were designed to literally fall off in the event of a fall. By shedding their batteries, such models greatly reduce the shock transmitted to the notebook itself—a defensive strategy that all notebook designs should employ. Generally, batteries in such designs are mounted to form two outside edges of the unit. Such models usually also have small lift-up levers for battery removal.

Compaq uses another drop-resistant design that is unfortunately more difficult to detect on sight: When dropped, a Compaq notebook looks like it's exploding, with switches, case fittings, and port covers splitting apart and flying all over. Again, this strategy greatly reduces the impact shock to sensitive internal components, and often you need only to snap the pieces back together.

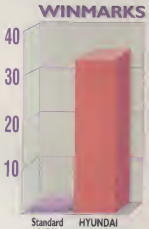
• Finally, as the fate of our Best Value Twinhead Slimnote demonstrated, the single best tool at your disposal for protecting your notebook PC is its carrying case. Since many notebook manufacturers offer both a basic, sheath-type case—which is little better than a dust cover, really—and a larger, more protective (and usually optional) premium carrying case, it pays to ask about this up front. Our tumble test indicated that a well-made, padded carrying case can mean the difference between a working laptop and one that's in the shop—even if you never check your notebook into baggage.

NEW BREED

DO SOMETHING

486 STAMPEDE

That thunder you hear on the PC prairie is the New Breed Hyundai 486 stampede. The hardest-charging, price-lean, MIPS-mean herd of computers you'll ever see. We're bringing everything from powerful 66MHz 486DX2 machines to Overdrive-Upgradable 486SX-25 computers. And with our 50MHz 486DX2 desktop PC and 486DX-33 blasters, you can handle today's demanding applications.



Do something "Longhorn" Local Bus.

That flash you see on the graphics horizon is the image of our Windows processing power triggering the Hyundai 486 stampede.

Your 486 processor was meant to run today's applications. So why rein in all that power? That out-to-pasture, 16-bit VGA card can only deliver 2 Megapixels at best. That's already dated technology. Let her rip with 32-no-blink-bits of "Longhorn" *Local Bus video acceleration.* And with up to 32 Megapixels *standard*, believe it, you'll see an incredible difference in Windows performance.

Do something thunderbolt.

Lightning-fast *"warpspeed" L2 caching* is another max-performance feature that's designed into every Hyundai 486. Thunderbolt write-back operations blast your DOS, Windows, or OS/2 data into a box canyon of ultra-fast SRAM. Start out with 128KB standard (more than the cow computers), then expand to 256KB to handle today's big applications. Cache hit for cache hit, the Hyundai 486 Family, with 128KB standard caching, delivers twice the MIPS of non-cached cows.

Do something upgradable.

The Hyundai 486 New Breed Family is designed in Silicon Valley, U.S.A., to out-perform the herd.

All of our systems are *CPU-upgradable* through a single chip via a *ZIF or Overdrive socket*, so the New Breed lets you double your speed. We won't let tomorrow's 32-bit operating systems blast a hole in your productivity. Just upgrade your Hyundai 486 to any higher-speed Intel 486 CPU in the future.

DO SOMETHING

486SX/33—$1999

This Hyundai 486SX-33 can out-muscle those barnyard bovines of cow country. But you be the judge.

Our 32 Megapixel "Longhorn" Local Bus?... or a 1 Megapixel moo cow? Our "faster-than-a-blink" *Windows accelerator video processing* tied to the speed of your 486 CPU?... or an old-fashioned bottleneck? Our *1MB VRAM controller* producing 1024 x 768 ultra-high, non-interlaced resolution?... or their tired cow VGA? Clearly, the prize goes to the Hyundai New Breed.

Compare our *standard 128KB of zero-wait state cache* with non-cached cows. And don't forget, the Hyundai 433S flexes its processing muscle up to 256KB of cache expansion. This system runs at the head of the stampede!

And we don't just drive the Hyundai stampede, we overdrive it! Double your speed by simply snapping in the *Intel Overdrive*™ *Processor*. And our advanced "warp-speed" L2 cache and "Longhorn" Local Bus graphics engine give your upgraded system the 32-bit video and fast SRAM you'll need for your higher-speed 486 CPU.

Hyundai 433S

- 33MHz 486SX w/ 8KB integrated cache
- 32-bit VESA local bus UVGA graphics w/1MB VRAM
- 128KB "warpspeed" write-back 20ns SRAM L2 cache (expandable to 256KB)
- Upgradable to 486DX power via Intel "Overdrive" socket
- 4MB system memory expandable to 64MB on system board
- 170MB 19ms IDE HDD, 32KB disk buffer
- 1.44MB 3-1/2" and 1.2MB 5-1/4" FDDs, (2.88MB-ready FDD interface)
- 14" non-interlaced, ultra-high resolution, .28 dot pitch, 72Hz refresh rate, flicker-free, color display w/1024 x 768 resolution, tilt and swivel base
- 25/1P, integrated PS/2 mouse port
- 5 external drive bays, 2 internal
- 7 expansion slots, including 1 VESA local bus slot
- 200 watt power supply
- 101 keyboard, 2 button mouse
- Built-in virus protection, front keylock, 2 level password
- MS DOS 5.0 and MS Windows 3.1

Hyundai 433S

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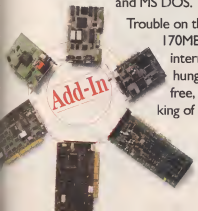

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- 2S/1P, integrated PS/2 mouse port
- 5 external drive bays, 2 internal
- 7 slots incl. 1 VESA Local Bus slot
- 200 watt power supply
- 101 keyboard, 2-button mouse
- Built-in virus protection, front key lock, 2 level password
- MS DOS 5.0 and MS Windows 3.1
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- 32-bit VESA Local Bus UVGA graphics w/1MB VRAM
- 128KB "warpspeed" write-back 20ns SRAM L2 cache (expandable to 256KB)
- Processor upgradable via ZIF socket
- 8MB system memory expandable to 64MB on board
- 360MB 12ms IDE HDD, 256KB disk buffer
- 1.44MB 3-1/2" and 1.2MB 5-1/4" FDDs
- 14" non-interlaced, ultra-high resolution, .28 dot pitch, 72Hz refresh rate, flicker-free, color display w/1024 x 768 resolution, tilt-and-swivel base
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Circle 133 on reader service card.

continued from page 150

test, the Twinhead lacked an essential ingredient: a decent carrying case. It made it through all the tests but this last one, when its backlight blew out.

Luckily, the folks at Twinhead saw the error of their ways. The company just introduced a brand-new carrying case (part number THD4001), which will run you an additional $49. It's a sure bet that had the Slimnote 4SX/25 been wearing this case during our tumble test, the backlight would have survived. If you decide to order this great notebook, though, please grumble about paying extra for a case that should come standard.

The Twinhead is roughly the second-best-performing notebook of the lot. Its memory is slightly slower than the Toshiba's, but its hard drive is a good deal faster. And though the TI's performance beats the Twinhead's, the difference isn't noticeable in practice. The difference in their cost is substantial, however. Comparably equipped with a 120MB hard drive, the Twinhead costs $524 less. (Of course, that's before you buy the padded carrying case.) The only drawback is its battery life. You can expect honest raw battery times of about two continuous hours, stretching up to two and a half hours with power management.

Keyboard design and feel, monochrome display quality, a standard internal trackball, the availability of a docking station, and the ability to upgrade to a 486DX/33 combine to make this package an amazing value. Twinhead is also offering the Slimnote in passive-matrix and active-matrix color versions (prices weren't set at press time), so if you've a hankering for color, you can get it.

Twinhead has some innovative support policies. If your Slimnote needs repair, just call the company for a return authorization number. Then take your notebook, its box, and the number to any one of the 1,500 Mail Boxes Etc. consumer-shipping centers. Mail Boxes Etc. takes it from there. You don't have to package the machine or address the box. You also get lifetime toll-free tech support, and the company maintains a BBS.

No doubt about it, the Slimnote is the reigning notebook champion. Unless long battery-charge life is your top priority (in which case you should take a look at the Toshiba), it's your best value in a 486 notebook.

Wyse DecisionMate 486SLC

IN BRIEF: This poorly designed notebook sacrifices bread-and-butter features for a small, lightweight design.
PROS: Very portable; inexpensive; blazing disk speed.
CONS: External floppy only; slow CPU, memory, and video; small display.

SOMETIMES YOU CAN get too much of a good thing. That's the case with Wyse's DecisionMate 486SLC. It has been engineered to be a miniature, lightweight marvel, but the downsizing comes at the expense of some things we all take for granted—like a floppy drive you don't have to plug in every time you want to use it or an internal modem that doesn't require permanently removing the external VGA and mouse ports.

Wyse DecisionMate 486SLC

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- 3471 N. First St.
- San Jose, CA 95134
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When you add an external floppy drive, the weight of this small notebook climbs to 6.22 pounds so that it weighs more than the TI, Gateway, Tandy, or Twinhead. Sure, you don't always need a floppy drive, but occasionally you do something stupid and need to boot from a DOS system disk.

To its credit, the Wyse boasts some great features, starting with a lightning-fast hard drive. Another attraction is the price—at $2,299 for the 80MB configuration, this is a very inexpensive 486SLC/25 notebook. The DecisionMate also comes with a plethora of gadgets and extras in the form of cables, small attachments, and security devices. Among these is LapLink software, which is certain to come in handy.

Unfortunately, there's more bad news. CPU, memory, and video performance are all abysmal, and the unit didn't prove very durable. Ironically, our mix-master vibration test significantly improved CPU performance—and it wasn't a temporary effect. If you buy this model, maybe you should bring it down to the hardware store . . . no, just kidding. A more telling result of the durability tests was that the backlight went out in the basic-drop test, which most notebooks passed unscathed. When a notebook fails this test, it's a strong indication that it won't take much to bend the notebook out of joint. Wyse says it has adopted a new screen since our tests, though, so the models currently shipping may be less susceptible to backlight problems.

The bottom line: If you don't mind the lack of an internal floppy drive or the small 8.5-inch display, consider the Wyse. Otherwise, look elsewhere.

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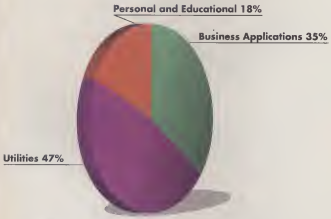
1992's 100 Best-Selling

Our annual report reveals what businesses bought in 1992. **By Preston Gralla**



Utility Sales Beat Out Business Applications

Largely due to the strength of Windows and DOS 5.0, utilities were the hottest selling software programs in 1992.

PHOTOGRAPHS BY STAN MUSIEK

WHAT'S HOT AND WHAT'S NOT? Which PCs do people prefer? Which software tops the charts? And what do the top-selling hardware and software products say about the way you compute today, and will compute tomorrow?

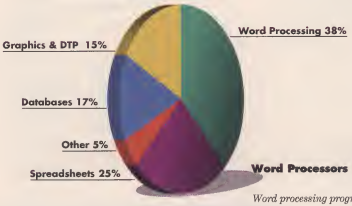
For answers to these questions, we've tracked hardware and software sales over the last year and compiled them into our second annual list of the 100 best-sellers. The list is divided into five parts: top-selling business applications, utilities, personal and educational programs, PCs, and printers. You'll find some old standbys on the lists, some new names, and more than a few surprises along the way.

The best-sellers provide a revealing snapshot of the state of computing today and indicate the direction computing will take tomorrow. One fact is abundantly clear: Windows drives the desktop. Sales of Windows-based programs such as Excel and the screen saver After Dark have skyrocketed, and Windows utilities are among the hottest sellers you'll find. As the year progressed, sales of Windows programs took an increasing portion of the market.

On the hardware side, 1992 saw the demise of 286-based PCs and witnessed the meteoric rise of 386- and 486-based PCs. And the much-maligned IBM showed why it's such a successful behemoth: It dominated PC sales. As for printers, while lasers and ink jets are strong sellers, dot matrix printers have hung on tenaciously.

Our list of top-selling software represents products sold through retail stores and distributors; it doesn't include products sold directly by software companies to users or corporations. Sales rankings and market break-outs reflect the number of copies sold, not the dollar volume, of all versions available (unless specified otherwise) on all platforms sold through these outlets and represent sales data from October 1991 through September 1992.

PC Products



Word Processors Rack Up Big Software Sales

Word processing programs and add-ins ran away with the majority of the business software market in 1992, mostly because of the continuing phenomenal success of WordPerfect.

The 10 Best-Selling Software Products of 1992

Only six of the top-selling programs of 1991 made our list this year. The four newcomers are MS-DOS 5.0, Excel, After Dark, and Stacker. The reason for the change is clear: Windows is taking over the desktop. Two of the newcomers are Windows-based, and a third—Stacker—undoubtedly got a boost because of all the hard disk space Windows and its applications require.

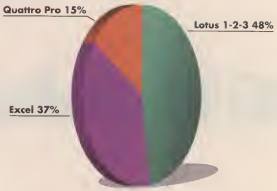
DOS 5.0 made the list because it's easily the best DOS ever, and because Microsoft sold upgrades through the retail channel.

	Program	Company	Category
1	**WordPerfect**	WordPerfect	*Business Applications*
2	**MS-DOS 5.0**	Microsoft	*Utilities*
3	**Windows**	Microsoft	*Utilities*
4	**Lotus 1-2-3**	Lotus	*Business Applications*
5	**QEMM-386**	Quarterdeck	*Utilities*
6	**Procomm Plus**	Datastorm	*Utilities*
7	**Word**	Microsoft	*Business Applications*
8	**Excel**	Microsoft	*Business Applications*
9	**After Dark**	Berkeley Systems	*Utilities*
10	**Stacker**	Stac Electronics	*Utilities*

TOP 20 BUSINESS APPLICATIONS

THE MORE THINGS change, the more they stay the same. That's what we found when compiling the Top 20 Business Applications list for 1992. Fifteen of last year's Top 20 best-sellers made the chart again this year, and the ranking of the top four programs remains unchanged from 1991.

But look closely, and you see: Windows dominates the desktop. The programs that fell from last year's Top 20 list were all DOS-based, and the five that replaced them were all Windows-based. Moreover, much of the sales growth for many top sellers comes from Windows, not DOS, versions. For example, Reference Software says that a full one-third of Grammatik's sales over the past year were for the Windows version. Those sales increased every month, so by the end of 1992, more than half of all copies of Grammatik that had been sold were Windows-based. The vast majority of Microsoft Word sales were also for the Windows version—from 85 to 88 percent, according to two major software distributors. The future is clear: Windows, Windows, and more Windows.



Excel Gains Ground, but 1-2-3 Hangs On

Excel's sales grew from 28 percent of the spreadsheet market in 1991 to 37 percent in 1992, taking sales away from both market leader 1-2-3 and third-place Quattro Pro. That's probably because 1-2-3's Windows version was widely viewed as substandard, and Quattro Pro didn't release its Windows version until late in the year.

WordPerfect Dominates, Professional Write Dies

WordPerfect's lion's share of the word processing market jumped from 60 percent in 1991 to a staggering 67 percent in 1992. Almost as surprising was the demise of Professional Write, which dropped out of sight in 1992 after capturing 7 percent of all word processor sales in 1991. Ami Pro came on strong late in 1992, although it had captured only 3 percent of all word processor sales by the end of the year.

WordPerfect

A lot of people will tell you that the secret to WordPerfect's success is the company's customer support—900 people answering umpteen 800-number telephone lines. It is the best in the business, but crediting support alone for racking up 10 million WordPerfect users ignores the program's power and ease of use. Straight out of the box, WordPerfect is easy to learn, even though the default function-key assignments are nonstandard in the DOS version. But if you don't like how WordPerfect works, it's easy to customize the program using its keyboard editor and powerful macro and mail-merge languages.

Although I've flirted with other word processors, I

keep returning to WordPerfect because it easily performs tasks they can't. When I hear other word processors being praised for this or that great new feature, it's usually old hat to WordPerfect. You don't easily abandon that kind of power. **RON WHITE**

Best-Selling Business Applications

	Product	Company	Comments
1	WordPerfect	WordPerfect	Despite a problematic Windows version, this software juggernaut rolls on.
2	Lotus 1-2-3	Lotus	Still the best-selling spreadsheet.
3	Word	Microsoft	Strong sales of its Windows version has kept this word processor here.
4	Excel	Microsoft	The best-selling Windows spreadsheet.
5	Paradox	Borland International	Simple-to-use, powerful database; moves up from 7th place last year.
6	Harvard Graphics	Software Publishing	Industrial-strength charting for DOS and Windows.
7	Grammatik	Reference Software	Grammar-checker for DOS and Windows; up from 9th place last year.
8	dBASE	Borland International	Definitive PC database slips from 5th place last year.
9	Quattro Pro	Borland International	Graphical spreadsheet that runs in 640K RAM.
10	Q&A	Symantec	Simple-to-use flat-file database.
11	FoxPro	Fox Software (Microsoft)	On the fast track: This database giant moves up from 18th place last year.
12	Calendar Creator Plus	Power Up Software	Calendar maker moves up from16th place last year.
13	CorelDraw	Corel Systems	Comprehensive graphics program for Windows; down from 12th last year.
14	PageMaker	Aldus Corporation	This standard for desktop publishing dropped from 10th place last year.
15	Windows Draw	Micrografx	Newcomer to the Top 20; easy-to-use drawing program.
16	Office for Windows	Microsoft	Bundle of Microsoft's business programs; a newcomer this year.
17	Approach	Approach Software	Vaunted Windows database rockets to 17th place despite being available for only six months.
18	Flow Charting 3	Software Corporation	Makes flowcharts; down from 13th place last year.
19	Ami Pro	Lotus Development	New to the Top 20, this word processor drew raves from magazine reviewers.
20	Publisher for Windows	Microsoft	This newcomer to the list, a low-end desktop publisher, features innovative PageWizards.

Excel

Why do I use Excel? Why wouldn't I? As far as Windows spreadsheets go, it's the only one that's happening right now. Yeah, I know, there's Lotus 1-2-3 for Windows, but it left the gate tentatively and is only now beginning to hit its stride. And sure, Quattro Pro for Windows makes for interesting competition.

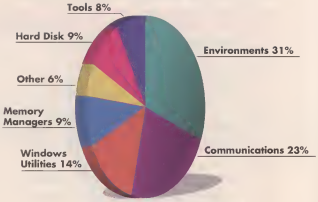
Truth be told, though, neither of the competing spreadsheets has the maturity of Excel 4.0. Tasks that used to be difficult now take mere seconds, like moving a range of figures with drag and drop or creating a list of months or days with AutoFill (Quattro Pro and 1-2-3 also have this capability, but Excel was there first). Last, nobody can touch the raw power of Excel's financial, engineering, math, and statistical functions. If you need to model it, goal-seek it, calculate it, graph it, or just futz with it, Excel is for you. DALE LEWALLEN

TOP 20 UTILITIES

THE TOP 20 UTILITIES list delivers one message loud and clear: Exchanging data among PCs has become of paramount importance to business users. Seven of the Top 20 best-selling utility programs, in one way or another, have to do with communications: They're either straightforward communications packages like Procomm Plus, remote-control packages like PCAnywhere, networking software like NetWare Lite, data-transfer software like LapLink Plus, or antivirus programs like Norton AntiVirus. Three of the seven communications-related packages are newcomers this year, which means that the future is clearly focused on communications. The business future might not, however, be in programming: Every one of the three programming-related packages (Microsoft's QuickBasic and QuickC, and Nantucket's Clipper) from 1991's Top 20 vanished this year.

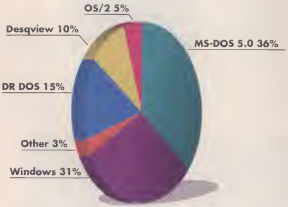
The 1992 list also shows that there's always room at the top for great software. For example, Stacker, which wasn't on our list last year, shot up to No. 6 this year. The Norton Desktop, also new in 1992, checked in at No. 11, while a third newcomer, Facelift for WordPerfect, came in close behind at No. 13.

The big news is that OS/2 2.0 made the list, taking the 20th spot. This time around, the advanced operating system from IBM is clearly for real: As soon as it was released, it became a best-seller. Expect it to take an even higher spot next year.



Communications Programs Establish Stronghold

As you might expect, sales of environments, which include DOS, Windows, Desqview, and OS/2, constituted the largest share of the utilities market in 1992. Surprisingly, however, communications programs aren't far behind.



Microsoft Still Rules the Environment Market

No wonder Bill Gates is now listed as the richest man in America—two Microsoft programs, DOS and Windows, accounted for 67 percent of all environment sales in 1992. Don't be surprised by the small wedge of the pie captured by OS/2. Its sales came on strong toward the middle of the year, and OS/2 will be a far more visible presence in 1993.

Windows 3.1

When asked by a reporter why he robbed banks, master safecracker Willie Sutton cleverly replied, "Because that's where the money is." I use Windows for a similar reason—because that's where the applications are.

An operating system without applications is about as useful as a New York City subway token in Detroit. Windows boasts the richest and most complete array of applications available for Intel-based PCs, so I'd be a fool to waste my time with any other environment.

PAUL BONNER

Best-Selling Utilities

	Product	Company	Comments
1	MS-DOS 5.0	Microsoft	The best DOS ever takes a deserved top spot; up from 10th place last year.
2	Windows	Microsoft	Version 3.1 is still selling like hotcakes.
3	QEMM-386	Quarterdeck	Top-notch memory manager proves that even DOS 5.0 can't do it all.
4	Procomm Plus	Datastorm Technologies	Powerful communications in either DOS or Windows versions.
5	After Dark	Berkeley Systems	Fun screen saver—watch out for the flying toasters! Up from 12th place last year.
6	Stacker	Stac Electronics	Newcomer rockets to the top; doubles your hard disk space.
7	DR DOS	Novell	The DOS alternative; up from 11th place a year ago.
8	Norton Utilities	Symantec	If you're serious about computing, you need these power tools. Down from 4th place.
9	Norton PCAnywhere	Symantec	Remote-access program controls both DOS and Windows.
10	PC Tools	Central Point Software	Every utility you can imagine plus the kitchen sink. Down from 5th place.
11	Norton Desktop	Symantec	Newcomer puts a new face on Windows—and DOS.
12	Desqview	Quarterdeck	Multitasking for DOS users. Down from the 8th spot last year.
13	FaceLift for WordPerfect	Bitstream	Scalable fonts for WordPerfect users. A newcomer this year.
14	LapLink Pro	Traveling Software	Makes file transfers easy between portable and desktop PCs.
15	Adobe Type Manager	Adobe Systems	Font management and control under Windows. Down from 9th place last year, possibly because of Windows 3.1's TrueType font technology.
16	Carbon Copy	Microcom	Remote-access program for DOS and Windows. Down from 13th place last year.
17	NetWare Lite	Novell	Easy peer-to-peer networking. A newcomer to the Top 20.
18	Norton AntiVirus	Symantec	Virus detection and cleanup. Another newcomer.
19	Close-Up	Norton-Lambert	A newcomer; remote-access program for DOS and Windows.
20	OS/2 2.0	IBM	IBM's advanced operating system climbed onto the charts despite being released several months into 1992.

Stacker

It's Parkinson's Law of hard drives: Programs and data expand to fill every megabyte of available disk space, and then some. Fortunately, Stacker came along at just the right time. The innovative (and nearly bulletproof) data-compression software effectively doubles the capacity of your hard disk. It's a godsend for older systems with undersize hard drives, and it's an absolute must on laptops. We thought it was special enough to earn an MVP award in 1991. Many of you must have agreed with our judgment, because Stacker made it to No. 6 in its first year on the Best-Selling Utilities chart.

ED BOTT

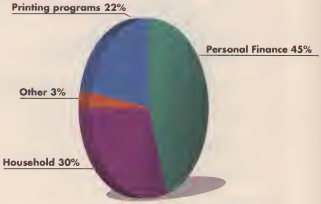
TOP 20 PERSONAL AND EDUCATIONAL APPLICATIONS

WHAT DO YOU do with your PC when you're not finishing up projects from the office? Many of this year's best-selling personal and educational programs help track finances and save you money. Four programs in the Top 20 fall into that category and account for more than one-third of all personal and educational software sales in 1992. Several other programs, such as Prodigy and Microsoft Works, have strong financial components.

Quicken, the top-seller, is selling stronger than ever with a new DOS and Windows version. In 1992 it accounted for 16 percent of all Top 20 sales in its category. Intuit, Quicken's maker, has several other winners, since newcomer QuickBooks shot onto the list and its companion program, QuickPay, came in just under the Top 20.

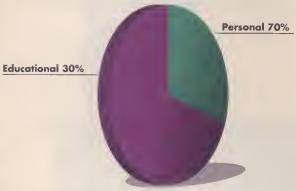
When it comes to education and games, there is one giant: Broderbund Software. That company makes six of the Top 20 programs, as well as others that didn't quite make this list. Broderbund's programs constitute 26 percent of all the personal and educational software sold in 1992.

What to expect in 1993? Lotus has invaded the personal-applications market. Late in 1992, 1-2-3 for Home was released and was garnering substantial sales. Next year, expect it on this list.



Quicken and Co. Command the Personal Market

The majority of personal-software sales in 1992 were financial programs. That trend should continue in 1993, as sales of Quicken-related programs continue to boom.



Personal-Finance Programs Flourish

When it comes to nonbusiness PC usage, personal use far outstrips educational use, largely on the strength of sales of personal-finance programs. In fact, personal-finance programs sold more in 1992 than all educational software combined.

TurboTax

Anybody who claims that using tax software makes filing your income tax fun is lying. But ChipSoft's TurboTax for Windows makes the annual ordeal a bit less painful.

I was a newlywed last year. TurboTax made combining two sets of income and expense records (both tracked in Quicken) into one tax return much less traumatic. It was easy to make changes and endlessly recalculate the bottom line using the program's Audit function to find errors and make suggestions.

No one likes to pay the IRS. But since it's inevitable, we use TurboTax to get it right the first time. My sweetie and I have better things to do than endlessly refigure our tax return. **JAN SMITH**

Best-Selling Personal and Educational Programs

	Product	Company	Comments
1	Quicken	Intuit	*Personal-finance manager for DOS, Windows.*
2	The New Print Shop	Broderbund	*Creates signs, banners, and cards.*
3	TurboTax 1991	ChipSoft	*Helps with tax preparation.*
4	AutoMap: The Intelligent Road Atlas	AutoMap	*Moves up from 14th place on 1991's Top 20 list.*
5	New Math Blaster Plus	Davidson	*Math program for children through grade 6.*
6	Prodigy Start-Up Kit	Prodigy	*Online service run by Sears and IBM.*
7	Reader Rabbit 2	Learning Company	*Reading development tool.*
8	Where in the USA Is Carmen Sandiego?	Broderbund	*Chase Carmen across the country and learn U.S. history.*
9	Where in the World Is Carmen Sandiego?	Broderbund	*The original Carmen caper; learn world geography.*
10	Oregon Trail	MECC	*Go west with 19th-century pioneers.*
11	TaxCut 1991	Meca	*Tax software; a newcomer this year.*
12	Family Tree Maker	Banner Blue	*Newcomer that keeps track of family lineage.*
13	Microsoft Works	Microsoft	*An integrated package with five modules.*
14	Kid Pix	Broderbund	*Newcomer; award-winning drawing program for kids.*
15	Where in America's Past Is Carmen Sandiego?	Broderbund	*Another Carmen caper.*
16	QuickBooks	Intuit	*Another newcomer; accounting for the nonaccountant.*
17	Expert Home Pack	Expert Software	*This newcomer helps with home design and more.*
18	Micro Cookbook	Pinpoint	*PC-based cookbook and meal planner.*
19	The Playroom	Broderbund	*Playful learning game for the preschool set.*
20	PFS:Resume and Job Search Pro	Spinnaker	*Helps job-seekers find work.*

Quicken

Which came first, the Quicken or the checkbook? This perennial best-seller makes managing your finances so natural that centuries from now evolutionists may wonder whether it predated the paper ledger. I use it to keep track of my checking account, as well as records of tax-deductible expenses like the moving costs I incurred when I migrated across the country in 1992. Quicken won my devotion because I could pop in and out of the program and enter transactions quickly, but Quicken is also powerful—legions of small businesses use it for single-entry bookkeeping.

Quicken is even aging gracefully. The new DOS and Windows versions include IntelliCharge, an electronic credit-card service you can use with a Quicken Visa Gold card, and financial-planning tools for loans, mortgage refinancing, retirement, and investments. The Windows version is now more usable and better acclimated to the graphical environment. With all this going for it, Quicken will definitely be the best personal-finance package for some time.

VINCE RYAN

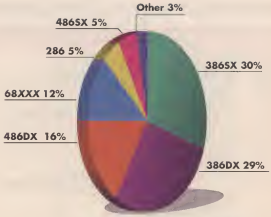
TOP 20 SYSTEMS

THE BIGGEST PC sales story of 1992 is the amazing decline of 286-based PCs and the equally remarkable skyrocketing of 386- and 486-based system sales. When we began tracking sales, 286s were at the top position, but they had vanished from sight 12 months later. Sales of 386s, meanwhile, went through the roof, as did sales of 486s. By the end of the charting period, 286 sales were almost nil, 386 sales were declining slightly, and 486 sales continued to grow remarkably.

The second hardware story of 1992 is that despite many pronouncements to the contrary, IBM is still the hardware heavyweight champion. IBM's 386, 486, and even 286 models all made our Top 20. And these PCs didn't just squeak in: Sales of IBM 386s, for example, were more than double that of Compaq 386s, which ranked No. 2 on our list.

The final hardware news of 1992 is the continuing success of mail-order vendors. Six of the Top 20 systems were from mail-order merchants, which explains why traditional PC makers such as IBM and Compaq had to cut their prices so sharply last year.

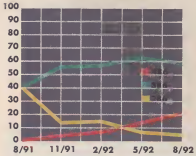
Note that in the following chart, we haven't broken out the sales of individual models, but rather, we've combined all the models from each manufacturer that are based on the same chip. For example, we combined all of IBM's various 386-based PS/2s into one category.



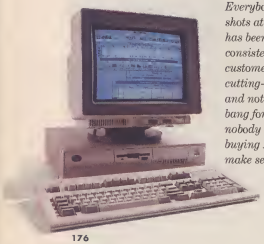
386s and 486s Become Business Standards

Although sales of 286-based PCs dominated the systems market early in 1992, 386- and 486-based PCs had become the business standard by the end of the year.

The Year of the 386, but Not for Long



The year 1992 tolled the death knell for 286-based PCs, whose sales started off strong and then plummeted. While sales of 386-based computers picked up the slack, they, too, had begun to fall by year's end because of the continuing rise in sales of 486-based PCs.



IBM PS/2s

Everybody likes to take shots at IBM. Big Blue has been chastised for consistently offering its customers less-than-cutting-edge technology and not giving enough bang for the buck. But nobody ever gets fired for buying IBM. The reasons make sense. First, technical support is abundant. One of the prerequisites for dealership authorization is that the dealer must offer onsite repair—sales and service in a one-stop shop. Also, everybody else's machines will work with IBMs, because they've been designed to the original IBM specs. Besides offering compatibility, PS/2s are a support person's dream: Configuring peripherals is an absolute snap—no fussing with jumpers or messing with IRQs. And IBM has been around forever. It doesn't look like the company is going to go away. Those guys in white shirts and blue suits run a class operation, which leads to the best reason for buying IBM: the name.

NATHAN GARCIA

True Intel 486 for Less Than $1,000!

Introducing FastMicro's 486/Valueline.

intel inside

Don't need all the extra features of our 486/Pro Series? Then the 486/Valueline is right for you. This system is truly a price breakthrough! FastMicro delivers a high performance 486 system at a low end price. Others can only offer a 386/SX for less than $1000 or substitute an imitation 486 that's more like a 386, FastMicro puts 25MHz 486SX power in your hands. Plus this isn't a 'bare' system, you get a system that's complete and ready-to-run right out of the box, including a Super VGA color monitor and card.

Loaded with Memory & Storage

CONNER

FastMicro also includes four full megabytes of high-speed SIMM memory! You can even expand the memory to a total of 32MB. Of course, how can you also expect to get a hard drive at this price? Well, FastMicro includes a quality Conner hard drive with an unbelievable 85MB capacity. Plus, since it's a standard IDE drive, you can easily add a second hard drive later.

Upgradable to Overdrive Processors!

The best part of this system is that you get legendary FastMicro upgradability too! Besides upgrading the memory and drive, you can upgrade later to a faster Intel processor. This system is completely Intel OverDrive™ compatible; which means you can upgrade your FastData 486 system all the way to a 66 MHz 486DX/2! And like all FastMicro systems, you can upgrade monitors, drives, etc. when you order.

Plus, It's from FastMicro!

Pay less and get more! FastMicro backs up this system with seven day a week toll-free technical support and express parts replacement at no extra charge. And should you have an unusual problem, we'll send GE on-site service or replace the system at no additional cost! We also include BBS support and a 30 day money-back satisfaction guarantee too! Try a FastMicro 486/Valueline PC, you'll agree that they offer a lot of power for the price.

GE Computer Service

4SX/25 $999

- i486SX™ 25mhz Processor with 8K Internal Cache & 64K Static Ram Cache.
- 486 Overdrive™ Processor Upgradable.
- 4 megabytes of high speed RAM.
- 85 mb 17ms IDE hard disk,.
- 1.44mb 3.5" floppy drive.
- Mini-Tower Chassis.
- 14" SVGA monitor, 1024x768 resolution.
- 16 bit SVGA card.
- Clock calendar, parallel port, game port and two serial ports.
- 6 expansion slots, 2 occupied.
- Microsoft DOS 5.0.

FASTMICRO **1-800-821-9000**

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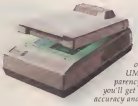
Circle 158 on reader service card.

It can pick a fly out of your pea soup. It never faints at the sight of blood. It can digest a whale in 60 seconds.

While these may not be the qualities you want in a dinner date, they may be precisely what you're looking for in a color scanner.

If so, meet the new UMAX UC840. Built using the same high-quality technologies that recently earned our other color scanners top marks from both *MacUser* and *PC Computing*.

The UC840 renders halftones, line art and text with hard-to-believe clarity and detail (800 × 400 dpi, to be exact). In fact, through software interpolation, you can get up to 1600 × 1600 dpi! Details that competitive scanners can lose sight of — like the wings of that annoying little fly — come through with particular clarity.



With the optional UMAX Transparency unit, you'll get maximum accuracy and flexibility.

Revolutionary one-lamp scanning and auto-calibration systems virtually guarantee that colors remain absolutely true to the original. (Blue blood may be fine for aristocrats, but the rest of us still prefer a nice, bright red.)

We'd also like to make a point about speed, if you have a minute. Because that's about all it takes the UC840 to scan a 4 × 5-inch color image (other scanners can take two to five times as long).

And if you have a few more seconds, we'll give you a few more important facts: The dynamic range is wide enough to read the most subtle differences between 16.8 million 24-bit colors, and 256 shades of gray. It's both Macintosh and PC-compatible. And image editing software is included, free of charge. If that weren't enough, the UC840 is incredibly easy to maintain. We even offer 48-hour turn around in the unlikely case repairs are required.

Call **800-562-0311** today, and we'll tell you where to catch a demonstration of the new UC840. (Feel free to bring along your dinner date.)

UMAX®

Maximize your image.™

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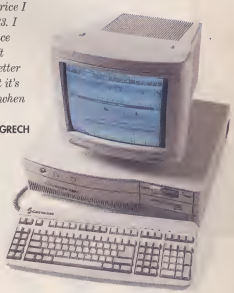
Circle 363 on reader service card.

Gateway

I'm not surprised that the Gateway 386 is among the best-selling systems of 1992; after all, it's the PC I call home. One of the advantages of working at PC/Computing *is that expert advice is always as close as a trip to the water cooler. When it was time for me to buy a PC last year, I wanted to make the right choice. I knew the Gateway was No. 1 in price and performance (having won top honors in its category in the* PC/Computing *200), but I needed to be sure. I was sold when I found out how many of my colleagues also had Gateways at home.*

But I do have one complaint: My 386/33 was outdated about a month after I bought it. The Gateway 486SX/25 became its replacement and offered even more performance for the same price I had paid for my 386 (and the potential to upgrade it to an SX/50). And as prices continued to drop, that ATI Graphics Ultra, 200MB Western Digital hard drive, and 8 megs of RAM I had so lovingly added to the 386 became standard components on a 486/33 for the same price I paid for my old 386/33. I keep trying to convince myself the 486 doesn't perform that much better than what I have, but it's hard to fool yourself when you work here.

CHRISTINE GRECH



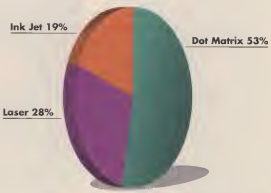
Best-Selling Systems

	Manufacturer and Type	Best-Selling Models	Comments
1	IBM 386	Various PS/2s	*Despite some hard times, IBM reigns as hardware leader.*
2	Compaq 386	386s, 386s/20, 3/25, Deskpro	*Compaq quality puts it at No. 2 on the list.*
3	IBM 286	Various PS/2s	*Some people still bought a 286—but only if it had IBM's name on it.*
4	Gateway 386	386/25, 386DX	*Gateway sits at the top of the mail-order heap.*
5	Hewlett-Packard 386	Vectra	*As this No. 5 ranking shows, HP makes more than just printers.*
6	Gateway 486	486DX, 486SX/25	*The top-selling 486 PCs in 1992.*
7	Everex 386	Step, Tempo	*Introduction of low-cost models figures into strong sales.*
8	Compaq 486	Deskpro	*High-end PCs from a quality systems maker.*
9	AST 386	Bravo, Premium	*Solid sales put AST on the Fortune 500 and Forbes lists, as well as in our Top 20.*
10	Dell 386	316, 316SX, 325, 333P	*From the well-known mail-order vendor.*
11	Dell 486	433P, 450DE, 486D, 486P	*Dell's top-of-the-line PCs.*
12	IBM 486	PS/2	*Primarily used as network servers.*
13	Compaq 386 notebooks	LTE Lite/25, LTE/386s, SLT/386s	*Top-quality notebooks rack up big sales.*
14	NEC 386	Powermate	*The maker of best-selling monitors and printers also delivers top-selling PCs.*
15	Packard Bell 386	Force, Legend	*Not a well-known corporate brand, but ubiquitous in same sales channels.*
16	Dell 386 notebooks	320N, 325	*The top-selling mail-order notebooks.*
17	Zenith 386 notebooks	Z-Note	*Revamped product line boosts notebook sales.*
18	Northgate 386	Elegance 386, Slimline	*This venerable mail-order seller squeaks into the Top 20.*
19	NCR 386	ELPC386sx	*Fighting the price-cutting wars pays off for NCR.*
20	Epson 386	Equity	*Printer maker breaks into the Top 20.*

TOP 20 PRINTERS

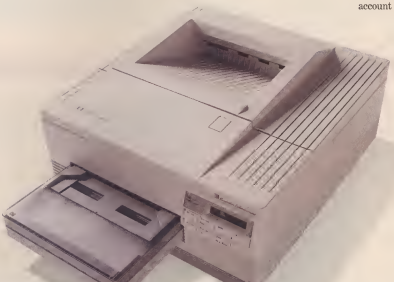
TO NO ONE'S GREAT surprise, laser and ink jet printers top 1992's best-selling printers list. Hewlett-Packard's models took the top three spots, four of the top five spots, and a total of eight places in the Top 20. There's so much variety in the market that low-end models are affordable to most businesses, while high-end models serve as network powerhouses. And Hewlett-Packard's DeskJet 550C even makes color affordable.

The real surprise is the unexpected strength of dot matrix printers. For several years, pundits have predicted the demise of these low-cost workhorses, but they show no sign of going away soon: Ten of the Top 20 printers were dot matrix. New models have more and more features, such as scalable fonts, that previously were available only on lasers. And with rock-bottom prices that are hundreds of dollars less than lasers, expect dot matrix printers to be around for a while.



Dot Matrix Printer Sales Soar

Even though laser and ink jet printers rank at the top of the Top 20 list, 1992 forecasts show that dot matrix printers account for the majority of printer sales.



HP LaserJet III

In an industry where standards are few, reliability is a sore point, upgrades are just incremental tweaks, and ease of use is too often an oxymoron (like business ethics or civil service), the HP LaserJet III is a dazzler.

Installing and using oddball printers can be madness. But because the HP has become the de facto standard, every single piece of software works with it. The thing runs like a Sherman tank. Grind paper through it all day long for months, and it happily chugs along without a glitch. HP users are starting to rival grizzled Volvo owners with their boring longevity tales.

Its slick Resolution Enhancement technology automatically sniffs out, then smooths out, jagged edges in text and graphics. Its built-in PCL 5 uses Agfa/Compugraphics Intellifont technology to let you scale and rotate fonts without PostScript (although a pricey but capable PostScript cartridge is available). To top everything off, each generation of LaserJets is cheaper than its predecessor. If only all PC products were this good . . .

PAUL SOMERSON

FREE LABOR.

Tired of drawing and redrawing the kitchen sink? The circuit board? The window frame? Now, AutoSketch® for Windows™ does the work for you. With a library of over 2,000 professionally drawn symbols included in this precision drawing program, you can quickly create everything from org charts to floor plans to design diagrams.

You'll be saving more than just time. Auto Sketch includes 13 incredible libraries of symbols–$500 worth–absolutely free. That's more symbols than most any other CAD program on the market.

Add to that an intuitive graphical interface, SmartCursors,™ on-line help, SketchTools,™ OLE support and DXF™ file compatibility. Now you've got a quick and effortless way to transform your rough sketches into production-quality technical drawings.

So give us a call at
1-800-228-3601 and ask for infopak A65. It's got everything you need to know about AutoSketch for Windows . . . including the kitchen sink.

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INSTANT ACCOUNTING

PCComputing MVP 92 FINALIST

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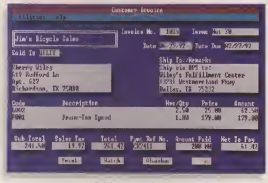
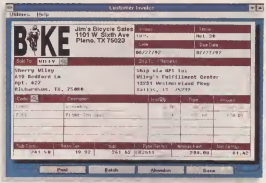
DacEasy Instant Accounting is packed with both DOS and Windows versions in one box for $49.95. Use DOS now, and switch to Windows later. Or, use Windows at the office and DOS at home. What a convenience!

For DOS or Windows Accounting in an instant, get DacEasy Instant Accounting and just add numbers.



DOS Invoice Screen



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Circle 229 on reader service card.

Epson LQ-570

Introduced more than a year ago, this 24-pin narrow-carriage dot matrix printer has held up by including state-of-the-art technology—scalable fonts—and by being offered for an excellent price, $499. Scalable fonts make business communications stand out from those printed in boring 10-point Courier. And with the ability to print up to 225 text characters per second in Super Draft mode, the LQ-570 is a perfect choice for printing documents that are mostly text—like those occasional long, rambling e-mail messages from your boss or summaries of your favorite "Star Trek" episodes.

CYNDY BATES

Best-Selling Printers

	Manufacturer and Product	Comments
1	Hewlett-Packard LaserJet III	*Standard-setting laser with Resolution Enhancement technology and PCL 5.*
2	Hewlett-Packard DeskJet 500	*The top-selling black-and-white ink jet.*
3	Hewlett-Packard LaserJet IIIP	*Low-cost version of the LaserJet III.*
4	Epson LQ-570	*Dot matrix printer with scalable fonts.*
5	Hewlett-Packard LaserJet IIP Plus	*Low-cost version of the LaserJet II.*
6	Panasonic KX-P1124i	*Versatile, budget-priced 24-pin dot matrix printer.*
7	Apple StyleWriter	*Low-cost ink jet from Apple.*
8	Epson LX-810	*Speedy, low-cost 9-pin dot matrix.*
9	Okidata Microline 320	*Solidly built 9-pin dot matrix.*
10	Hewlett-Packard DeskJet 500C	*Color version of the top-selling ink jet.*
11	Hewlett-Packard LaserJet IIIsi	*Remarkably fast network version of the best-selling laser printer.*
12	Hewlett-Packard DeskWriter	*Low-cost 300-dot-per-inch ink jet.*
13	Okidata OL 400	*Low-cost personal laser printer.*
14	Epson LQ-1170	*Wide-carriage 24-pin dot matrix printer with scalable fonts.*
15	Panasonic KX-P2123	*Superquiet 24-pin dot matrix printer with optional color module.*
16	Okidata Microline 320/321	*Heavy-duty wide-carriage 9-pin dot matrix printer.*
17	Hewlett-Packard LaserJet IIID	*Rugged version of the LaserJet III that prints on both sides of a page.*
18	Epson LQ-870	*Narrow-carriage 24-pin dot matrix with scalable fonts.*
19	Panasonic KX-P1180	*Low-cost 9-pin dot matrix printer.*
20	Okidata Microline 380	*Sleek, reasonably priced 24-pin dot matrix.*

These software charts are compiled annually by G. Meier, Inc., which gathers ranked-order sales information from the following software industry sources: ABCO Distributors; American Software; Babbages; CompuAdd; CompUSA; Corporate Software; Dustin Discount Software; Electronic Arts Distribution; Ingram-Micro; Kenfil; Merisel; Micro Warehouse; Multiple Zones; PC Connection; Soft Kat; Software, Etc.; Software Plus; Software Resource; Software Spectrum; and Waldensoftware. A weighting system is applied to each entry based on three factors: the entry's position in the individual chart, the power of the contributing source based on annual gross sales, and the relative strength of a source in a given category of software.

System sales data was provided by the Computer Intelligence PC Market Monitor, which tracks purchases of PCs by corporations, government, and educational institutions. Printer sales information was provided by Storeboard, a market-tracking firm, and printer forecasts were provided by the industry-tracking firm InfoCorp.

Get a better de on a better 1-2-

Now that's good news for anyone buying a Windows™ spreadsheet. First, we recently updated 1-2-3® for Windows so it now gives you more of the features you've been looking for in a Windows spreadsheet. Second, we lowered the price to just $495.* (Plus, for upgraders, and for a limited time only, we've included the SmartPics™ Clip-art Sampler absolutely free.)

$495

Of course, when you come right down to it, there are plenty of other reasons why 1-2-3 for Windows is the best spreadsheet choice you can make.

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1-2-3 for Windows now includes more than 25 new features and usability enhancements, as well as a robust set of GUI development tools.

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Better still, we're offering license packs for network users so you can set up your network configurations more cost-effectively. All of which makes Lotus® 1-2-3 for Windows the best deal in a Windows spreadsheet.

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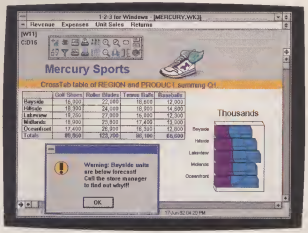

*Suggested retail price. **In Canada, call **1-800-GO-LOTUS.** Eligible spreadsheet products include 1-2-3, LotusWorks, Symphony,® Microsoft® Excel and Quattro® Pro. Please have your credit card and product package ready when you
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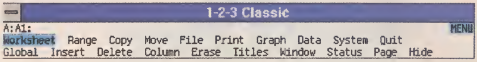
What's more, only 1-2-3 for Windows offers



you a better compatibility bridge from DOS to Windows. And unlike Excel, 1-2-3 can read and execute *any* 1-2-3 for DOS file, style and macro.

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Its 3D technology and external data access capabilities are better than Excel's.

In 3D technology, 1-2-3 is unsurpassed. It gives you easy access to 256 worksheets and lets you build true 3D formulas. Excel's Workbook is a mere imitation. That makes 1-2-3 for Windows a more powerful tool that truly helps you consolidate data, spot trends and make better, more timely business decisions.

Corporate Computing (8/92) wrote that *"for the experienced 1-2-3 database user, 1-2-3 for Windows with DataLens® is the front-end tool of choice."* Excel's data access capabilities rely on a third-party product with limited relational capabilities.

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PAINLESS PEER-TO-PEER LANs

No fuss, no muss, no MIS—five easy networking solutions for the Windows office.

YOU CAN'T TAKE IT ANYMORE. You've carried that floppy disk to another PC to print your spreadsheet so many times that you've practically worn a groove in the floor between your desk and your colleague's. Face it, those expensive Nikes were not designed to be part of the SneakerNet—the informal connectivity option that makes you an inefficient link between two PCs.

Fortunately, there's an alternative to buying a pair of Air Jordans for each member of the staff. A peer-to-peer local area network—or LAN—can bridge the gap between no connectivity at all and a full-blown network that requires an engineer to install it and an administrator to run it. Peer-to-peer LANs allow users to share data, hardware

What Is a Peer-to-Peer LAN, Anyway?

The elegantly named peer-to-peer local area network was originally defined as one in which any station on the network (called a *client* or a *workstation*) could act as a file server, sharing its local resources like a printer, a disk drive, or (in some cases) a modem. The machine (or machines) acting as server could also be used concurrently as a workstation. Traditional dedicated-server networks like Novell NetWare or Banyan VINES, on the other hand, require machines dedicated solely to the task of sharing resources, which are typically locked up in a server room somewhere and maintained by MIS priests.

As peer-to-peer networks have become more powerful and stable, however, the line between the two types of networks has begun to blur. Today's peer-to-peer solutions give you the choice of running a small network on which some of the workstations share resources as servers or a network on which dedicated file and print servers (locked in closets) serve hundreds of client PCs—something that only dedicated-server networks have done in the past. Now you can enjoy all the advantages of easy file transfer and robust peripheral sharing without the concomitant need to hire an army of LAN administrators or to wrestle with the installation and support of a dedicated server.

BY DALE LEWALLEN

PHOTOGRAPH BY HOWARD SCHATZ

peripherals, and—if you're not in too much of a hurry—applications. These networks are generally easy to set up and operate, and they are typically as powerful as dedicated server-based local area networks were just a few years ago.

In the early days of peer-to-peer networks, the software was often fragile and subject to the usual vagaries of DOS. But today you can find peer-to-peer features in stable DOS and Windows versions (including Microsoft's upcoming Windows NT) and, if rumors are true, in future versions of IBM's OS/2 2.0 and LAN Server. Once perceived as a cheap-and-dirty networking solution, peer-to-peer LAN systems are now considered viable solutions for the lower end of the market, where small work groups have been unable to justify the equipment, installation, and day-to-day support costs of conventional server-based networking.

Improved capabilities don't mean that peer-to-peer LANs are completely without hassle or struggle, though. While many of these systems are easy to set up, someone still has to actually install them, handle day-to-day support chores, and even nurse a "sick" system, identifying and fixing network problems. And because the work group or small business probably won't have a full-time staff person dedicated to solving problems, a peer-to-peer LAN can be both a blessing and a curse. For this reason, ease of installation and administration are as important as price in choosing a solution.

In our search for viable alternatives to the SneakerNet, we concentrated on products that provide a Windows interface for networking utilities. All basic peer-to-peer network operating systems have a DOS-based user interface for tasks like changing passwords, adding and removing users, sharing disks and printers, and sending e-mail messages. For users already familiar with the Windows interface, however, it makes sense to provide networking features in this same comprehensive environment they're accustomed to. To accommodate these users, you should make sure not only that the product supports Windows for resource sharing but also that it doesn't force users to exit to DOS just to use a network resource or to send a message to another network user. All the products provide at least some of their functionality through a Windows interface.

Most small networks are composed of ten or fewer users. We told manufacturers that we wanted to create a small network of nine machines—eight workstations and a server—and asked them to send us the necessary hardware and software. Specifically, we asked each vendor to supply everything required to install a complete network, and all the systems had to run on industry-standard Ethernet cabling and use standard Ethernet network adapter cards to ensure compatibility and to allow for expandability. If your work group grows to include other groups or is swept into the corporate network, Ethernet cards and cabling will help make the transition easier. Some companies offer less-expensive versions of their networks that run on proprietary cards and cabling. While the proprietary alternative will save you money initially, you'll probably spend more in the long run if you want to expand your network.

We found five products that met our criteria: Tiara Computer Systems' 10NET, Invisible Software's InvisibleLAN, Artisoft's LANtastic, DacEasy's MainLan for Windows, and Microsoft's new Windows for Workgroups. We evaluated the shipped versions of the first four products and the final beta version of Windows for Workgroups. Missing from this list is Novell's popular NetWare Lite, which was not available in time to be included in this review. For a late-breaking bulletin on the new NetWare Lite, see "NetWare Lite Gets a New Windows Look," page 195.

BEST VALUE

LANtastic, Windows for Workgroups Lead the LAN Pack

Unlike some categories of products where it's easy to determine a single winner, peer-to-peer LANs didn't offer a simple solution. Among the products that provided access to their features via Windows, we found two that truly deserve the Best Value title.

If most of your work group uses Windows, the best choice is **Windows for Workgroups.** Microsoft has simply added tightly integrated networking capabilities to the standard Windows 3.1 product. Printer sharing, for instance, is where you would expect to find it—under the Print Manager—while file sharing can be found in the File Manager. To complete its network solution, Microsoft has thrown in a complete e-mail system and a cool group-scheduling package. Connectivity options let you connect to a Microsoft LAN Manager server or to a NetWare server right out of the box.

If you're weaving some DOS machines into your network, look to Artisoft's **LANtastic for Windows.** While Windows for Workgroups (understandably) wants to run on Windows machines but will accommodate DOS PCs, LANtastic was built to run well on DOS systems. That doesn't mean Artisoft has skimped on Windows functionality, though. Like Windows for Workgroups, LANtastic's Windows interface lets you control every aspect of the networking software from Windows, so you don't have to drop to DOS just to share a drive or change a password. Also like Windows for Workgroups, LANtastic provides controls to let you easily decide how you want to divide performance between network services and applications that run on the server. Finally, you'll be able to grow with LANtastic. With connection options that you purchase separately, you can connect to a Novell NetWare network, to Unix networks via TCP/IP, and to a Macintosh network.

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And he's not the only expert who has doubts about QEMM: "a potentially risky procedure," "serious disk performance problems" (*PC Magazine*), "more and more contrived" (*PC/Computing*).

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©1992 Qualitas. Qualitas, 7101 Wisconsin Avenue, Suite 1386, Bethesda, MD 20814. *All company and product names are trademarks or registered trademarks of their respective owners.* **System Requirements: Any 386, 386SX, 486 or 486SX PC or PS/2, min. 256K of extended memory, DOS 3.0 or higher, and hard disk drive. (386MAX also supports 286 machines with Shadow RAM, or any PC with EMS 4.0 hardware with 256K memory. Feature availability and memory recovery may vary on these systems.)**

10NET 5.0

Tiara Computer Systems ■ 1091 Shareline Blvd. ■ Mountain View, CA 94043 ■ (800) 638-4272, (415) 965-1700

IN BRIEF: Tiara's 10NET software provides better-than-average utility for small networks. You'll find better Windows integration and features in products such as LANtastic and Windows for Workgroups, though.

PROS: Sturdy networking system; good expansion options; readily available technical support.

CONS: Cumbersome installation process; weak feature support from within Windows.

Tiara Computer Systems' motto is "Life should be simple." We think that installing and using a network should be simple, too, and for the most part, we found that Tiara's peer-to-peer solution almost lives up to the company's slogan. Because Tiara is a mature player in the field (the company was established in 1985), we were a bit surprised to see some rough edges in 10NET's Windows integration and method for adding workstations to the network. But as your networking needs become more complex, Tiara is a company that you can grow with.

Price

The starter kit, which includes two 16-bit ISA Ethernet adapters (thin Ethernet only), 25 feet of cable, T-connectors, terminators, 10NET 5.0 network operating system software, and 10Windows software, lists for $699. Each add-on kit sells for $299 and includes one 16-bit ISA coaxial Ethernet adapter, cable, and a license for one additional node. The total cost for our eight-user network came to $2,792.

Installation

Installing the two-node starter kit was fairly simple. Each Ethernet adapter is a 16-bit AT-style ISA card with several jumpers. When we tried to install the card using the default settings, though, we found that one jumper on each board was not set the way the reference card said it should be—not really an auspicious start. Just for the heck of it, we tried the card without making any adjustment, and everything worked fine.

During the installation process, you specify any resources you want to share on the server (printers, disks, and so on) and indicate if you want to connect automatically to other servers on the network. Then the install routine asks if it should modify your AUTOEXEC.BAT file before it finishes. The routine creates a batch file that automates the connection process. After you reboot your PC, just type GONET, and your PC will load all the requisite software and connect to the other servers that you specified.

Adding workstations was a bit of a challenge. Installing a new workstation requires using a key floppy disk from the kit. If you try to load the software without the key disk, a message warns you of a "Possible License Violation." If you try to hook up to the network, the same message appears—and then your computer locks up. It's reasonable for Tiara to want to protect against software piracy, but this arrangement means that you'll need the single disk you used initially to reinstall a workstation. If you try to use another key floppy disk, you'll get the violation message and be unable to connect.

Windows Features

We were surprised to find that the 10Windows manual contained information on loading the software but nothing on operating it. Since we're adventurous, we started clicking on commands to see what would happen.

10Windows goes only halfway toward providing the full range of network functionality through a Windows interface. Many tasks still require you to load a DOS session and run DOS network software. With 10Windows, you get one application window on your desktop with three smaller windows inside: one for the Chat feature, another for monitoring system messages from the network, and the third for connecting to shared drives or printers. Note, however, that if your PC is a server and you want to make a resource available, you have to load a DOS session. While hardly a replacement for a traditional mail application, Chat is useful for sending one-line messages to another user on the LAN. If you prefer to

Tiara's 10Windows offers a bare-bones level of integration with Windows via the Chat, Network, and Monitor icons. You can use the Network dialog box to connect to or disconnect from servers.

use 10NET's five-user DOS version of Da Vinci Mail, you must exit to DOS or load a DOS session from Windows to access it.

Technical Support

Toll-free telephone support is available from 8 a.m. to 8 p.m. In addition, Tiara answers support questions via its own BBS.

InvisibleLAN 3.13A

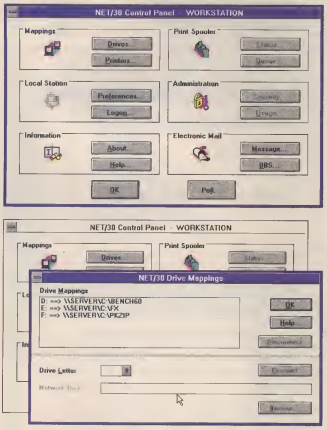
Invisible Software ■ 1215 N. Highway 427, Suite 135 ■ Longwood, FL 32750 ■ (800) 982-2962, (407) 260-5200

IN BRIEF: InvisibleLAN offers plenty of expansion and connectivity options, including support for TCP/IP networks. Its usability and Windows functionality, however, fall short of the competition's.

PROS: Offers good connectivity to other networks and reliable performance.

CONS: Weak integration and inconsistent user interface with Windows; unnecessarily complicated installation.

Invisible Software's InvisibleLAN works as advertised—after you get past its harder-than-necessary installation process. Once it's set up, you'll have a sturdy network for both DOS and Windows users, and Invisible also sells a line of adapters if you decide to expand your Ethernet network. At press time, Invisible Software was planning to ship Version 3.2, which adds features such as uninterruptible power supply (UPS) monitoring and a Windows-based network remote-control utility. Like Tiara's 10NET, however, InvisibleLAN doesn't fully exploit the Windows interface. An extra $200 will buy you the same functionality with Artisoft's LANtastic, a more mature and better implemented product.



InvisibleLAN's (NET/30's) Control Panel lets you chose from many network activities, depending on whether your PC is configured as a server or workstation. The Drive Mappings dialog box lets you connect to servers on the network.

Price

The InvisibleLAN Ethernet starter kit includes two 16-bit ISA Ethernet adapters, a 25-foot cable, terminators, T-connectors, and an unlimited-user license for both DOS and Windows workstations for $599. Each additional workstation kit costs $299 and includes a 16-bit ISA Ethernet adapter, cable, and T-connector. The total cost for our eight-station network was $2,692.

Installation

InvisibleLAN's installation process was fairly straightforward, but the software and its interface are overly difficult for people without a lot of networking experience. Invisible Software earns points for including spiral-bound manuals, so you can lay them flat on a work surface and you don't have to use your elbows to hold them open. InvisibleLAN's documentation isn't perfect, however: The product was recently renamed, and we found confusing references to it in the documentation and the software (see the screens at left) as both NET/30 and Invisible Network. By the time you read this, though, the company should be shipping an updated product.

Windows Features

Unlike most Windows programs, which you set up by simply running a Windows installation program, InvisibleLAN's Windows component requires you to run Windows' DOS Setup program. Once you've installed the InvisibleLAN network driver, you can start Windows, open the Control Panel, and double-click on the Network option to see InvisibleLAN's Windows functionality. If you want faster access to the same feature set, you can manually add an icon to one of your Program Manager groups, but we wish the installation program could do this for you automatically.

InvisibleLAN's Windows utility gives you control over the resources you share if your system is a server as well as those your system uses from other servers. You can perform user and group administration tasks, including assigning rights and permissions for various network resources, and gather usage statistics for the network. The Windows utility also lets you set up drive mappings to particular servers by pointing and clicking on server and directory names. These drive mappings work only for the current session, however—if you want the drive map-

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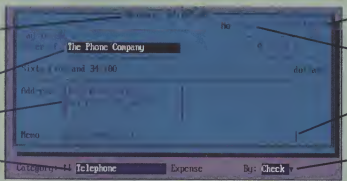
Category. Assigns your transaction to one or more budget categories.



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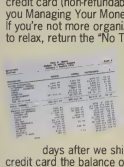

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Like other peer-to-peer systems, InvisibleLAN includes a rudimentary messaging feature. The manufacturer has the bravado to call this feature Mail, but there isn't even a pull-down list to see who else is on the network—you have to know the name of the person you want to send the message to. The product's BBS feature is a bit more interesting. Essentially a store-and-forward mail system, it lets you post messages to the bulletin board for others to see. Also, as on a real BBS system, messages are *threaded,* or kept in order, by topic, which facilitates conversation.

Technical Support

Telephone technical support is available from 8:30 a.m. to 8:30 p.m., and it's a toll call. Invisible Software also maintains a support BBS and has a fax-back service for frequently asked questions.

NetWare Lite Gets a New Windows Look

While the appearance of NetWare Lite from network giant Novell legitimized the category of peer-to-peer networking solutions, the product logged behind competitors in providing feature-rich Windows integration. Until now, Windows users had to load a DOS session and use DOS commands to perform tasks like changing passwords or sharing directories. The latest version, however, provides access to essential network functions from within Windows. Although Version 1.1 arrived too late to be included in this review, we finagled a sneak preview of NetWare Lite's new look.

If you already have the requisite hardware and cabling, you can purchase NetWare Lite 1.1 for $99 per workstation. If you don't have these components, you can purchase NetWore Lite bundled with network adapter cards and cables. Currently, three vendors include NetWare Lite with their peer-to-peer networking products: Ansel Communications (408-452-5041), Eagle (800-733-2453, 408-441-7453), and Xircom (800-874-7875, 818-878-7600). We looked at Ansel's peer-to-peer solution, but the networking software will function identically with the Eagle and Xircom products. Ansel's $499 starter kit includes two copies of NetWare Lite, two 16-bit Ethernet adapter cards, cabling, documentation, and an installation video. Additionol workstation kits con be purchosed for $299. In our hypothetical work-group scenario, the LAN costs total $2,592—about average compared

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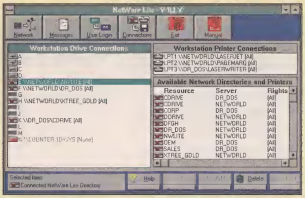
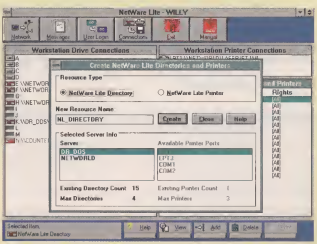
Installing the hardware and software was easy. The explanatory videotape is helpful, and as an additional aid, the installation process draws a simple graphic on your PC's screen showing you how to set the network interface card jumpers. Only Microsoft Windows for Workgroups has an easier network installation process.

Setting up the NetWare Lite Windows utility (called WNET.EXE) is equally straightforward. After you've installed Windows and the NetWare Lite program, the WNET installation process makes some modifications to your SYSTEM.INI file and creates a new Program Manager group and icon.

WNET supports most of the tasks you can do from DOS using a Windows interface instead. You can perform workstation tasks such as logging in to servers on the network, synchronizing your PC's time with a server's, changing passwords, and displaying user account information. You can also use a server to share directories and printers, change other users' access rights to shared directories and shared printers, and change the status of a print job within a queue. Like most other products reviewed here, NetWare Lite has a crude messaging system that is limited to messages of only 30 characters. At least Novell doesn't call it a mail feature.





NetWare Lite's new Windows support is substantial. The new button bar makes it easy to access available network resources. The dialog box (bottom screen) lets you share a directory on your system with others on the network.

Novell

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Peer-to-Peer Packages Compared

Product	Documentation	Starter Kit Installation	Adding Workstations
10NET 5.0 $2,792 (eight users)	Four reference cards: 10NET command reference guide, 10NET configuration card, Ethernet cabling guide, and Ethernet adapter reference guide. Four manuals: 10NET reference manual, 10Windows installation guide, user manuals for 10NET 5.0 and Windows 3.0.	Starter kit includes two 16-bit ISA Ethernet adapters (thin Ethernet only) and a 25-foot cable. ➨**The procedure for setting jumpers wasn't correctly documented, but installation was otherwise straightforward.**	Each workstation kit comes with an Ethernet adapter, cable, and software key floppy disk. ➨**This specific key disk is required for installing the software.**
InvisibleLAN 3.13A $2,692 (eight users)	Three manuals: *Invisible Network Update Manual* and *InvisibleLAN User's Guide* (two volumes). ➨**Spiral binding makes the manuals easy to consult.**	Starter kit includes two 16-bit ISA Ethernet adapters (thick or thin Ethernet) and a 25-foot cable. ➨**Installation was harder than necessary for this class of product.**	Each workstation kit includes an Ethernet adapter and cable. ➨**Once you've gotten past the starter kit installation, this part's easy.**
BEST VALUE **LANtastic 4.1** $2,892 (eight users)	Five manuals: one for Ethernet adapter; one for LANtastic for Windows interface; a reference manual, an upgrade manual, and a user manual for LANtastic OS. ➨**All documentation is well written and well illustrated.**	Starter kit includes two 16-bit ISA Ethernet adapters (thick or thin Ethernet) and a 25-foot cable. ➨**Only Windows for Workgroups was easier to install.**	Each workstation kit includes an Ethernet adapter and cable.
MainLan for Windows 1.04 $2,000 (eight users)	Four manuals: one for MainLan for Windows, one for MainLan GTi; two for Compex Ethernet cards. ➨**Documentation is problematic because software and hardware manuals don't refer to each other.**	Starter kit includes two 16-bit ISA Ethernet adapters (thick or thin) and a 25-foot cable. ➨**Jumpers on the cards must be set, which is no easy task given the many possible options for configuring the card and the unclear documentation.**	Each workstation includes an Ethernet adapter and cable. ➨**As with server installation, adding adapter cords to the workstation is difficult because the accompanying documentation is unclear.**
BEST VALUE **Windows for Workgroups 3.1** $2,775 (eight users)	Four manuals: a modified Windows 3.1 user's guide; *Getting Started* guide; manuals for Mail 3.0 and Schedule Plus.	Available in different versions, the starter kit reviewed here included two 16-bit ISA Ethernet adapters and a 25-foot cable. ➨**The installation process is well thought out and well illustrated.**	Each workstation kit includes an Ethernet adapter and cable, as well as a copy of Windows for Workgroups.

Software Installation	Windows Networking Features	Conclusion
10NET 5.0 NOS software has you specify the resources you want to share and whether you want to connect automatically to other network servers. ➡**The install routine modifies your AUTOEXEC.BAT and creates a batch file to automate the connection process. Installing 10Windows is a separate step.**	The 10Windows interface consists of one application window containing three smaller windows: one for network Chat, one for monitoring system messages, and one for connecting to shared devices.	10NET provides limited Windows functionality, but Tiara's networking solution is otherwise easy to use and install.
InvisibleLAN NOS software comes with an unlimited-user license. ➡**Installation is straightforward, but network drivers need to be loaded in a specific order. Installing the Windows component, strongely, requires running Windows' DOS setup program.**	Features of InvisibleLAN's Windows software include central over drive and printer mappings; the ability to set user preferences, including persistent drive mappings; central over print spooling and print-job priority; user administration, including management, rights, and permissions; mail and BBS system.	InvisibleLAN offers good expansion and connectivity options. Usability enhancements and improvements in the Windows interface would make this product a winner.
The LANtastic 4.1 starter kit NOS includes licenses for 300 nodes. ➡**The NOS includes intelligent features to optimize server performance and security. Installing the Windows utilities is a snap.**	Network utilities contained in a LANtastic program group give you: the ability to connect to and disconnect from network devices; basic e-mail capabilities; network Chat feature; print-queue management; user and resource management; a disk cache.	LANtastic's strengths are its Windows integration and robust DOS-based workstation support. Consider this Best Value for networks that combine DOS and Windows machines.
The installation process for the MainLan for Windows NOS requires you to choose the correct card name and install a network device driver. ➡**Neither of these steps, however, is mentioned in the documentation.**	MainLan for Windows' features that can be accessed through the Network icon in the Control Panel include shared resource management; the ability to connect to shared resources; and the ability to send messages to other users.	Consider MainLan for Windows only if price is an overriding issue. The features you get don't make up for the difficulty entailed in installing the product.
Starter kit comes with two copies of Windows for Workgroups NOS software. Installation is like that of regular Windows 3.1 on a PC (choose Express or Custom setup), with additional network questions added to the process. ➡**Installation is a breeze because the adopters are automatically recognized by the software and require no interrupt request or memory settings on the user's port.**	A single-user license for Windows for Workgroups is included with each workstation kit. The plentiful Windows networking features include Mail 3.0, a full-scale e-mail package; Schedule Plus, a groupware app for scheduling; Chat, for sending messages; WinMeter, a utility for checking system-resource status; and NetWatcher, a utility for checking shared-resources status.	Microsoft's Windows for Workgroups earns top honors for its excellent Windows integration. Real e-mail and scheduling packages add value to an already excellent program.

BEST VALUE

LANtastic 4.1

Artisoft ■ 691 E. River Rd. ■ Tucson, AZ 85704 ■ (800) 846-9726, (602) 293-6363

IN BRIEF: With its easy installation and extensive Windows support, Artisoft's LANtastic sets a high standard for products in this arena. Artisoft also offers extensive support for other networks and operating environments, including OS/2, Macintosh systems, and TCP/IP networks.

PROS: Provides a wide range of connectivity options to other networks and operating environments; excellent integration with Windows.

CONS: None.

With its LANtastic NOS now available in Version 4.1, Artisoft has captured the lion's share of the peer-to-peer market. And it's no wonder. LANtastic 4.1 offers a superb collection of peer-to-peer networking services and Windows utilities. Combine that with a wide variety of options for connectivity and expansion, and you have a sure winner. Even Microsoft's well-integrated Windows for Workgroups will fight an uphill battle against LANtastic.

LANtastic's Windows utility gives you consummote control over your networking activities. The Account Management diolog box (top) lets you restrict users from accessing the network at certoin times of the doy.

Price

LANtastic 4.1 starter kits, which bundle the LANtastic for Windows module (usually sold separately for $299), sell for $799 and include two 16-bit ISA Ethernet adapters (for thick and thin Ethernet), a 25-foot cable, and the LANtastic network operating system software on 3½- and 5¼-inch disks for 300 nodes. Additional 16-bit ISA Ethernet adapters sell for $299. Our eight-station network cost $2,892.

Installation

Only Microsoft's Windows for Workgroups was easier to install than LANtastic. We found the Ethernet adapter manual to be well written and clearly illustrated. To Artisoft's credit, the manual recognizes that you might want to use these cards with other networks and even describes which jumper settings to use with networks from competitor Novell.

Artisoft has done its homework to ensure that its network operating system is full featured and can handle different scenarios. LANtastic was, for example, the only peer-to-peer system we tested that includes support for UPS equipment. Once LANtastic is installed with a serial cable linking the server and the UPS, users will be automatically alerted to an impending problem and an orderly shutdown of the server will be performed before a power outage.

Artisoft also realized that you might want to dedicate a server for optimum performance. To that end, you'll find a program on the server called ALONE that effectively turns your peer-to-peer server into a dedicated server. As with Novell's Monitor function, you can't actually work on a server that's running ALONE—you can only use it as a file or print server. ALONE even lets you enable password protection so that uninvited guests can't escape back to DOS. And if you have enabled password combination so that the server won't go down.

Windows Features

Installing the Windows utilities for LANtastic is simple. Just insert the single disk into the floppy drive and type A:INSTALL from the File, Run command of File Manager or Program Manager. It doesn't get much easier than this.

The installation routine creates a program group called LANtastic that contains two icons, one for the LANtastic NET program and one for Network Manager. LANtastic NET is loaded automatically from the LOAD= line in WIN.INI. While this ensures backward compatibility with Windows 3.0 users, we would like to have seen the install program determine which version of Windows

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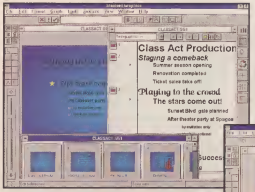

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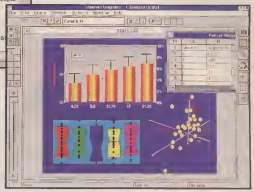

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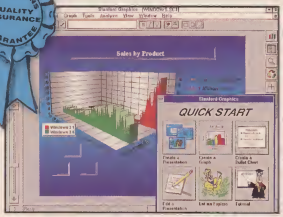

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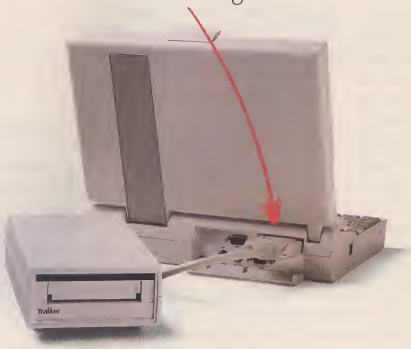

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was running and install the program in the Start Up group if it determined that you were using Windows 3.1.

The networking features available to a Windows user in LANtastic are too numerous to list here. When you click on the NET icon in Program Manager, you can choose from several functions. For example, you can log in to or out of various servers on the network by selecting them from a dialog box. The Windows utility can also show a real-time, graphical display of the network load. The Network Manager icon provides additional features for managing individual and group accounts, as well as such resources as printers or CD-ROM drives. There's even a utility that lets you set server parameters (such as the maximum number of users and size of printer buffers) and performance parameters (such as buffer and cache sizes). The Network Manager can also enable event auditing, which will record user log-ins, log-outs, printing events, and so on.

Technical Support

Telephone technical support is available Monday to Friday from 7 a.m. to 5 p.m. You can also receive support by fax, via a CompuServe forum or Artisoft's BBS, or from a fax-back system.

MainLan for Windows 1.04

DocEasy ▪ 17950 Preston Rd., Suite 800 ▪ Dallas, TX 75252 ▪ (800) 322-3279

IN BRIEF: We were disappointed with the overall quality of MainLan for Windows. DacEasy's product pales in comparison to the obvious attention to fit and finish from vendors such as Microsoft and Artisoft. By cobbling together some software and some OEM network adapters, you can get a functional network, but MainLan doesn't measure up.

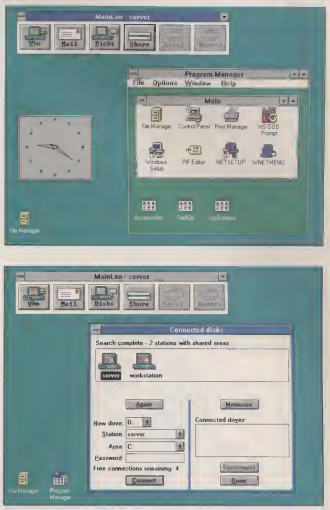
PROS: None.

CONS: Difficult installation process made worse by poor documentation; weak Windows support.

Like Invisible Software's InvisibleLAN, DacEasy's MainLan for Windows is an older product that has recently changed hands, and the lack of attention from its various owners is obvious. While the basic parts work fine once you get past the obstacle-course installation process, many users will just give up and try something else. Despite MainLan's low price, we can't find any reason to recommend that you spend your networking dollars on it.

Price

The basic starter kit retails for $599.95 and includes two 16-bit ISA Ethernet adapters (for thick and thin Ethernet), 25 feet of cable, T-connectors, terminators, and a 64-user license for the MainLan for Windows software. Additional Ethernet adapters sell for $199.95 each. At these prices, our eight-station network could be had for a miserly $2,000.



MainLan's limited Windows functionality is presented via the six-button toolbar at the top of the screen. The Connected disks dialog box (bottom) uses a graphical display to show the other systems to which you can connect.

Installation

Confusion reigned from the outset. While the documentation states that the product is called MainLan GTi from an English company called The Sage Group, the packaging claimed that the product was called MainLan for Windows and was sold by a company in Florida. The actual review unit, however, was sent to us from the current owner: DacEasy, in Texas. Still with us? DacEasy says that a new release of the product (with updated documentation, we hope) will ship in late summer 1993.

The installation was much harder than it had to be. The Compex adapters are clearly just OEM cards included with the software, and the Compex documentation reflected that. There was no mention of MainLan, just a confusing jumble of jumper settings. Faced with several dozen ways and modes to configure the cards, we decided to simply install them as they were shipped and hope everything worked. It didn't. A call to technical support revealed that we had chosen the wrong name for the card

during the installation process. Since none of the available choices mentioned the Compex adapter, we'd had to guess which one to install: MainLan-4 adapter, MainLan-10 adapter, or Other. The one that worked? Other.

Moving on, we followed the documentation's instructions to type NETLOAD, only to receive a "Bad Command or Filename" message. Then we noticed a command called INSTALL that wasn't documented in the manual. Could this be the one we wanted? It was. Next, we tried to start the program but got an error message saying that the network driver couldn't be found. After we'd spoken to tech support, we found out that we had never installed the driver because this important detail had been omitted from all the manuals. From this point on, the network ran just fine, but nothing could change the fact that MainLan's installation was, without a doubt, the worst we had ever attempted. Of any product. Period.

The process of adding more workstations was essentially the same. Each kit includes the ubiquitous Compex cards, and there's the same lack of helpful documentation. Of course, once you've stumbled through the original installation, adding more workstations is comparatively easy.

Windows Features

To access Windows support, you either run the Control Panel and then double-click on the Network option, or click on the Windows Control Panel application and then on the Network icon. MainLan's Windows utilities are meager, however, and they don't expose all of the program's network functionality. With MainLan's Windows interface, you can manage shared resources like printers and disks, share drives and directories on PCs configured as servers, and manage remote and local printers. And a rudimentary mail application lets you send short messages to other users on the network. But while we've come to expect an online help file in any Windows app, none was to be found in this product.

Technical Support

DacEasy provides toll-free technical support for the first 90 days, from 8 a.m. to 6 p.m. The company also provides technical support on a BBS and via a CompuServe support forum.

BEST VALUE

Windows for Workgroups 3.1

Microsoft Corp. ■ One Microsoft Way ■ Redmond, WA 98052 ■ (800) 426-9400, (206) 882-8080

IN BRIEF: The latest entry in the peer-to-peer market, Windows for Workgroups gives LANtastic a run for the money. This is the product to choose if most of your users run Windows.

PROS: Best integration with Windows; excellent documentation; e-mail, client, and scheduling software included.

CONS: Requires server machines to run Windows; network runs best on Windows-based systems.

For a small business or work group that runs—or plans to run—Windows on all or most of its workstations, Microsoft's Windows for Workgroups is the hands-down choice. Windows for Workgroups is at heart just a version of Windows 3.1 with integrated printer and disk sharing, integrated e-mail, and group scheduling, all rolled up into one elegant package.

Price

This product is available in several variations, depending on whether you want the hardware or the software, whether you use Windows 3.0 or 3.1, and so on. For com-

How We Tested

Most peer-to-peer LANs are quite small—usually fewer than six or seven PCs connected together to share e-mail, common applications, and peripherals like printers and disks. To test the performance of the peer-to-peer LANs reviewed here, we built a network of eight Compaq Deskpro 386/25M PC workstations. An additional system was configured to act as the server. Each PC had 4MB of RAM and ran DOS 5.0 and Windows 3.1 from a 120MB hard drive.

Because we wanted to see how well each complete package worked, we tested each network with the network adapters, cables, connectors, and software provided by the manufacturer, completely installing a new network each time we changed products.

We used ZD Labs' NetBench 1.0G test to measure the networks' performance. In order to test system throughput, NetBench runs on each workstation and automatically creates a .5MB and 1MB file on the server. Then each workstation performs writes and reads to and from the files on the server. When you consider that most files sent between workstation and server are quite small and that all eight workstations rarely make requests of the server at the same time, you can see that NetBench really gives the system a workout.

Test results show that the performance of a peer-to-peer network in a small work group (where it's under for less strain than with NetBench) isn't a factor that you need to dwell on. What good is a system that's 3 to 5 percent faster than another if it's nearly impossible to install or configure? The network will be far more valuable—not only for the installer but also for users—if it is easy to install and use on a daily basis. If network users don't embrace the benefits, the entire work group loses.

In the small-network environment, you should expect to see performance and response time similar to that of a high-end, dedicated-server networking solution. As your network grows and becomes interconnected with other users and networks, however, you'll want a high-end system to deliver both efficient performance and extensive connectivity.

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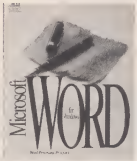

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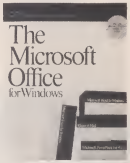

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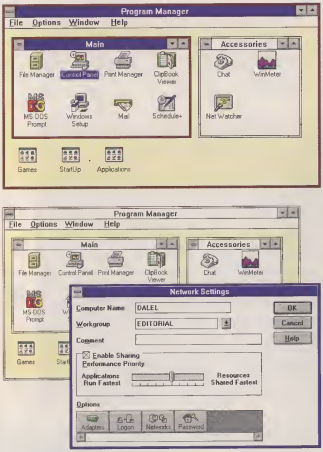

Windows for Workgroups adds several new Windows utilities to your familiar Windows environment. The Network Settings dialog box lets you balance local application speed against resource-sharing performance.

parison with the other products in this review, we ordered the starter kit—which includes two 16-bit ISA Intel EtherExpress Ethernet adapters, 25 feet of cable, terminators, T-connectors, two copies of the Windows for Workgroups software on 3½- and 5¼-inch floppy disks, and even a screwdriver—for $849.95. Additional workstations, each of which includes one 16-bit ISA Ethernet adapter, cable, terminator, and one license of Windows for Workgroups, sell for $274.95. The total cost of our eight-station network came in just under LANtastic, at $2,775.

Installation

The software installation is a regular Windows 3.1 setup with a few additional questions about networking. As with Windows 3.1, you choose between the Express and Custom setup. If you're installing Windows for Workgroups on a computer that's already running Windows 3.1 (which means you're just adding the networking components and the Mail and Schedule Plus programs), then your existing fonts, program groups, and desktop settings are saved. For our setup, we chose to install the product on a machine that was not running Windows. After choosing the Express setup and answering a couple of questions, we just sat back and swapped floppy disks. The most time-consuming part of the process is copying the data to your hard disk.

Installation is simple because the setup program recognizes the included Intel cards and automatically copies the correct drivers from the Microsoft disks. Then the install process sniffs out the correct interrupt request and base address to use. Finally, the program asks if you want to use Windows for Workgroups with Microsoft LAN Manager, Novell NetWare, or another network. This capability is one of Windows for Workgroups' most attractive features because it lets you take advantage of all the wide-area connectivity and expansion inherent in those environments.

When you configure your server to share resources, you usually don't have a lot of control over how much of the machine's resources will be co-opted by the network operating system. With Windows for Workgroups, you can easily set the ratio of performance between the server and the user of that PC by just sliding a control to one side or the other. This feature is analogous to Artisoft's ALONE program.

Since Windows for Workgroups was designed to be used in a Windows environment, any machine that will share its resources must run Windows for Workgroups. If you have some workstations that need to run only DOS, however, you can purchase a separate product called the Workgroup Connection for DOS ($79.95). In addition to connecting the DOS workstations to the server machine, Workgroup Connection gives you a DOS version of the Microsoft Mail 3.0 client. The only caveat is that a DOS machine connected with Workgroup Connection cannot share resources—that is, a DOS-only machine cannot be a file server, it can only be a client. To share files or printers, a machine must be running Windows for Workgroups.

Windows Features

Windows for Workgroups features a full-blown Mail 3.0 e-mail client that is identical to the standalone version of Mail, except it doesn't support gateways to mail networks (such as CompuServe or MCI Mail) or remote access to your mailbox. If you need that kind of support, you can purchase the Microsoft Mail and Schedule Plus Extensions for Windows for Workgroups for $495 (each gateway is an additional cost). The program also includes a complete groupware application, called Schedule Plus, for scheduling appointments and meetings with others on the network.

The other peer-to-peer networking products in this review are primarily DOS-based LANs enhanced to provide some access through Windows. In contrast, Windows for Workgroups is first and foremost a Windows-based peer-to-peer LAN product. Its Windows integration is largely built into the Windows File Manager and Print Manager. For example, to share a drive, you highlight

that drive or directory in the File Manager and then click on the icon of a hand holding out a folder—which represents sharing a directory with the network. To use a shared resource, you click on the appropriate icon in the File Manager of the workstation where you want to use the resource.

Other bundled utilities include Chat, which sends brief messages between workstations; WinMeter, which shows how much of your system your applications are using versus how much other users on the network are using; and NetWatcher, which shows you who is connected to your PC and what resources (disks or printers) they're using.

Technical Support

Technical support for Windows for Workgroups is available by telephone Monday through Friday from 6 a.m. to 6 p.m. You can also get support via an interactive voice support system that provides recorded answers to questions and can fax back information to you. Finally, Microsoft has a BBS and several CompuServe support forums that contain updated drivers and answers to common questions.

The End of SneakerNet?

Our original goal was to purchase complete networking solutions from every manufacturer, and our subsequent experience proved the wisdom of seeking an integrated product. While in every case we were able to acquire products from one source, we found significant variation in quality. In Best Value LANtastic, for example, Artisoft has taken pains to integrate the hardware with the documentation, and the result is a product that's exceptionally easy to use. And even though our other Best Value, Windows for Workgroups, uses Intel network adapters, the documentation has been written to specifically address card installation. In contrast, in DacEasy's MainLan product and, to a lesser extent, InvisibleLAN, we found little coordination between the software documentation and the network adapter card documentation. In both cases, our questions were quickly answered by contacting technicalsupport specialists, but better integration of components would have eliminated this step.

The bottom line is that the most inexpensive solution isn't necessarily the best value in a peer-to-peer LAN. A network is no improvement over the SneakerNet if it's difficult to install and administer. But if you choose a well-integrated solution whose functionality is accessible to users, your Windows work group will likely discover that the added benefits of shared data and resources are worth the investment of time and money. Who knows? You might find yourself wearing out those Nikes on the local basketball court instead of in the office.

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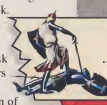

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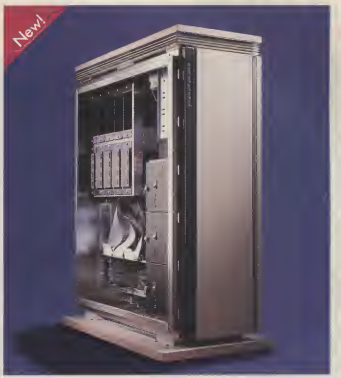

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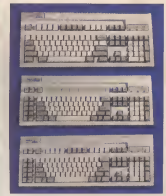

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FIRST IN A SERIES

THIS OLD PC

How should master renovator BOB VILA "remodel" his PC to keep pace with his expanding business? *PC/COMPUTING*'s own upgrade expert, WINN L. ROSCH, takes him (and us) through the process.

BOB VILA weighed the same choice he'd faced dozens of times before—whether to renovate or tear down and make a fresh start—but this time he was stumped. Certainly his decade-long tenure as America's home-improvement expert had prepared him to balance the advantages and costs of modernization vs. replacement, but the subject in question was out of his field. Rather than renovating an ailing homestead, he was considering overhauling his PC.

THE UPGRADER: ....Bob Vila, America's home-improvement specialist
THE GOAL: .....High-speed graphics for electronic viewing of blueprints and architectural renderings
THE OBSTACLES: ....A slow processor, insufficient memory, and a plain-vanilla Super VGA card
THE SOLUTION: .....Upgrade from 20MHz 486SX to 50MHz 486DX; 4MB RAM to 12MB; Super VGA to accelerated 1,280-by-1,024 graphics

Throughout his years hosting "This Old House" on PBS, Bob had no PC—he never needed one to manage his Boston-area projects. But with his new program, "Bob Vila's Home Again," the scope of his work expanded across the country. Bob installed a small LANtastic PC network to help him work with text and run his company, BVTV.

BY WINN L. ROSCH

PHOTOGRAPHS BY HENRY HILLARD

UPGRADES, ANYONE?

You don't have to be a celebrity to get free advice. If you're looking for guidance in your own PC renovation project, write to Winn L. Rosch at This Old PC, PC/Computing, *950 Tower Lane, 20th Floor, Foster City, CA 94404, and describe in detail your present system, how you'd like to see it improved, and your proposed budget. Please include your address and a daytime phone number.*

This season takes Bob to Malibu, California, where he's supervising the transformation of a prosaic beachfront home into a Spanish-style masterpiece. The project poses new logistical problems. Bob operates from an office on Cape Cod, Massachusetts, his contractors are in Malibu, and his architects might be anywhere. Bob wanted to monitor progress electronically, reviewing copies of plans and revisions on his PC. But the laggardly response of his system, a stock EISA-bus PowerMate 486SX/20e from NEC, demanded the patience of an Old World craftsman every time he scrolled a high-resolution graphics screen.

My challenge was to find the best way to give Bob the graphics performance to move from blueprints to paperless planning—without disrupting the rest of his office. The requirements were easy to outline: more processor horsepower, more memory, and accelerated video. The problem was finding the appropriate upgrade avenue for Bob's PC. As with renovating a house, we had a wide variety of choices—everything from calling in a dozer and scrapping the whole system to learning to live with bad graphics the way some folks put up with wallpaper that previous owners might have installed only under terrorists' threats.

Step one was the strategy session, determining what we had and what we needed. Bob's PowerMate was essentially the way it came out of the box, enhanced solely by an Artisoft Ethernet adapter. In addition to the NEC's native 486SX processor, the system included 4MB of RAM and built-in Super VGA graphics capable of 1,024-by-768-pixel resolution. It wasn't a bad foundation on which to build, but it definitely wasn't state-of-the-art for a graphics workstation.

PROCESSOR POWER

Heavy-duty graphics work demands a combination of the fastest possible microprocessor and a floating-point processor. Bob's PC lacked the latter, and its processing power was at least one generation behind.

To give Bob the performance he needed, we had two primary upgrade options. We could work at the chip level and add an Intel OverDrive to the PowerMate's upgrade socket, doubling the processing speed (to 40MHz) and adding coprocessor power simultaneously. Or we could work at the board level and swap processor modules. NEC had the forethought to make the PowerMate upgradable. The microprocessor fits on its own proprietary expansion board complete with high-speed cache memory. A simple board swap not only would push speed up to 50MHz but would also add 128K of 20-nanosecond cache memory. The upgrade microprocessor, a 486DX, would of course include a built-in floating-point unit.

But the tough decision was whether either strategy really made sense. In Bob's years of contracting, he'd learned the hard lesson that the choice between renovation and replacement involves more than economics. For example, the $250,000 budgeted for the update of the Malibu house falls tantalizingly close to the cost of new construction. The preferred upgrade for Bob's system—NEC's proprietary DX50 processor replacement board—lists for $3,149, far more than the cost of an entirely new system with similar speed potential.

In home improvement, though, it's often the intangibles that resolve the issue of renovation vs. replacement. The desire to preserve a style, the sentimental value of an older home, or simple social ecology can overrule all but the most overwhelming economic arguments. Similar considerations often govern PC improvement strategies.

Bob was more familiar with a tool belt than with his word processor's toolbox. In fact, he'd put his hands on his PC for the first time little more than a year ago. He

MY CHALLENGE WAS TO FIND THE BEST WAY TO GIVE BOB THE GRAPHICS POWER TO MOVE FROM BLUEPRINTS TO PAPERLESS PLANNING—WITHOUT DISRUPTING HIS OFFICE.

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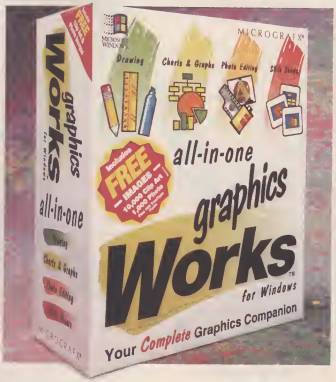

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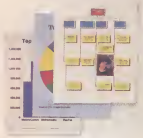

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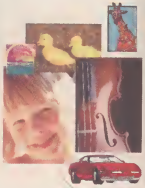

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was finally comfortable with his current system, and making a quick change was not a welcome prospect. An upgrade would make for an easier transition to higher performance.

Moreover, switching systems might have repercussions across his network. Although LANtastic is a peer-to-peer network, Bob's PowerMate packed a big disk that essentially acted as the server for the rest of the office. A major change—a new PC—would mean reconfiguring the network, moving megabytes of files, and perhaps spending days ironing things out to get the network to run properly again.

Bob opted for the certainty and familiarity of the upgrade route. Although the list price of the DX50 board was daunting, as a contractor Bob knew the truth—no one pays list price for anything, including the NEC upgrade. He could count on a street price of at least 20 percent less than the retail tag. Moreover, the price for the job seemed fair if based only on the cost of materials. At the time of the upgrade, a 50MHz 486DX processor alone (without the memory, secondary cache, or ancillary circuitry) had a street price approaching $1,000.

Opting for the proprietary upgrade brought another benefit—actually three of them. The DX50 board includes three zero-insertion-force (ZIF) sockets to allow further upgrades: to Intel's upcoming Pentium processor, to a Weitek coprocessor, or to whatever semiconductors the future might hold. Where the OverDrive would be the end of the line, the DX50 kept Bob's options open.

MORE MEGABYTES

In comparison, the decision about memory was clear: Bob needed more. While the stock 4MB was sufficient to lift Windows 3.1 off the disk, more would add better performance, particularly with memory-hungry design-and-drafting applications.

THE DECISION ABOUT MEMORY WAS CLEAR: BOB NEEDED MORE. HIS STOCK 4MB WAS ENOUGH TO RUN WINDOWS, BUT 12MB WOULD SATISFY MEMORY-HUNGRY DESIGN APPS.

The PowerMate came with a memory expansion board complete with 12 sockets for standard 36-bit SIMMs. Filling all of the sockets with economical 1MB modules would push the system to 16MB. Just because the sockets were there didn't mean we had to fill them, however. Proper planning means taking a hard look at what you need and not wasting time or money on things you won't use.

BOB OPTED FOR THE FAMILIARITY OF THE UPGRADE ROUTE. AND IT WOULD MAKE FOR AN EASIER TRANSITION TO HIGHER PERFORMANCE.

If Bob wanted to move eventually to OS/2 or to Windows NT, he'd want at least 8MB of memory. More than that would be superfluous. Besides, leaving a few sockets unfilled would allow Bob to add 4MB or larger SIMMs in the future (when they become affordable) without having to discard existing memory. Consequently we elected to keep four sockets—and our options—open by moving only to 12MB, adding eight 1MB SIMMs.

REVVING UP VIDEO

Video proved to be another complex decision. The PowerMate's resolution wasn't lacking—the PowerMate pushed Bob's NEC MultiSync 3FGx to the limit—but its performance and color capabilities could be improved. After all, the PowerMate's internal video system was designed before two new technologies had become the rage: local bus and Windows acceleration.

Local-bus technology—which, interestingly enough, NEC pioneered but did not put in the PowerMate—holds the greatest promise. By transferring data into video memory at, or close to, microprocessor speed, local bus sunders the 8MHz, 16-bit video bottleneck most PCs face. But to add local bus to a PC, you must replace the system board—and that's just one step away from replacing the entire unit. Besides, the PowerMate's design precluded any such replacement because its proprietary motherboard layout put mouse and keyboard connectors on the front and other I/O ports at the rear, so a generic replacement motherboard with local-bus circuitry simply wouldn't fit.

Moreover, our timing wasn't right for moving Bob to local-bus video. The VESA Local Bus specification had been approved only a week before we considered the upgrade. Systems and motherboards based on it wouldn't appear for months. Everything on sale at the time Bob

A CONTRACTOR AT HEART AND THE OWNER OF HIS OWN BUSINESS, BOB KNEW A GOOD DEAL—FREE LABOR—WHEN HE SAW IT.

needed his upgrade was a proprietary local-bus design, and this made future upgrade possibilities look bleak.

By exploiting all the latest video performance technologies, however, we could get within about 10 percent of the speed of the best local-bus systems, while staying with ISA (Industry Standard Architecture). The key element we looked for was a Windows accelerator. Because the accelerator performs drawing and most other graphics functions in the video card's memory, it suffers the bus speed penalty only when moving blocks of data intact from disk to screen. The accelerator is also more adept at carrying out graphics commands than is the microprocessor in a PC.

Having decided on a Windows accelerator as our upgrade strategy, we needed to work out the details—which accelerator and how much video memory. The amount of memory would determine the resolution and the number of colors we could display onscreen. Because Bob would be dealing with renderings as well as blueprints, he needed the realism afforded by true-color capabilities. For a detailed view onscreen, we needed at least 1,024-by-768 resolution.

We chose the $799 ATI Graphics Ultra Pro with 2MB of memory, which offers excellent performance and yields up to 1,280-by-1,024 resolution, without interlacing, in 16.7 million colors (albeit not simultaneously—to get top resolution you must revert to 256 colors). Aside from offering Windows acceleration, the Graphics Ultra Pro also improves display performance with a *direct-memory aperture:* Instead of requiring memory paging to access video memory, it reserves a range of addresses in extended memory that its driver can directly access. In addition, the Graphics Ultra Pro provides a full 32-bit data path between its accelerator chip and its virtual RAM (VRAM) storage.

Although ATI offers an EISA (Extended Industry Standard Architecture) version of the Graphics Ultra Pro, we opted for ISA—there's no point in having a 32-bit bus connection when today's graphics software still is 16-bit. (Bus transfers are governed by the system microprocessor, which runs 16-bit graphics code. Transfers between the accelerator chip and VRAM use ATI's 32-bit firmware.) When we get real 32-bit video, we'll probably want to upgrade to a new accelerator, too. And when that time comes, we can move the ISA board into another PC in Bob's network—even if the machine doesn't support EISA. In other words, ISA gives us all we need now and also holds more potential, at least for Bob's system.

MAKING THE UPGRADE

I thought we'd taken every variable into account in planning Bob's upgrade, but I should have consulted my horoscope. The stars did not particularly favor my adventure. I booked passage to Cape Cod and BVTV two weeks in advance, only to encounter an airline strike that started the day before my scheduled departure and caused a flurry of adjustments in my itinerary. The outcome: I had only four hours to do the job. (The strike, needless to say, was settled the day after my return.)

A photographer was enlisted to document my progress, making the ordinary upgrade task particularly onerous. Had Boswell been a photographer, I'm convinced Dr. Johnson would have disappeared invisibly into the ages, the documentary of his life never finished.

After the drive down to the Cape, I received a warmer welcome than I'd have expected in chilly New England. A contractor at heart, Bob knew a good deal—free labor—when he saw it.

He led me to his office, a huge open space that was more modern than almost anything this side of the millennium. Bob's PC stood between two short filing cabinets that had been converted to a worktable by a sheet of marble.

Once we'd warned the office crew that we were taking down the network, we switched off the system and pulled it from its den. The cables came off in seconds, and a couple of twists to the screws on the rear panel freed its cover.

We stared at the jumble of components inside. Then I discovered that Bob had the same appreciation for my skill as for the talent of someone who could pound a nail in straight without get-

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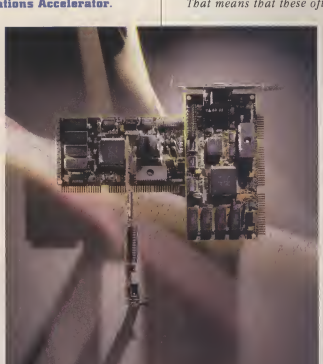

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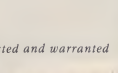

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ALL TOLD, WE'D BEEN INSIDE BOB'S POWERMATE FOR LESS THAN 15 MINUTES. ADD THE TIME WE SPENT POSING FOR THE PHOTOGRAPHER, AND IT ALL TOOK ABOUT 4 HOURS.

ting bloodstains on the wall—he let me do all the work.

I declined his offer of a Craftsman screwdriver and pulled out my own toolkit. Two screws held the PowerMate's processor board in place. Once I'd lifted it out, I removed the jumper that switched off the PowerMate's internal video system and slid the DX50 upgrade board into place. Another screw loosened the memory board, into which I popped the eight SIMMs. After I slid the memory board back into place, I pulled out a blank card-retaining bracket and slipped the Graphics Ultra Pro into place.

After a quick check to be sure I didn't have any screws left over, I slid the lid back on the PowerMate. Bob and I put the system back into place, plugged it in, and booted it up—only to receive an error message. Fortunately, it was exactly what we expected. The PowerMate had to be reconfigured to understand and accept its new brain. Once you have the right disk in the drive slot, the configuration process is automatic.

A few minutes later, the network was back up and we were discussing which resolution to configure the Graphics Ultra to use. Adjusting the board was another software chore, but one we could manage with the rest of the network in operation. That last chore done, I wished Bob well and was on my way.

All told, we'd been inside Bob's PowerMate for less than 15 minutes. Add in the time spent imploring Boswell to keep my hair from looking too thin in the final prints, and the project just filled the four hours available.

Like my advice to Bob, the photographer's was carefully reasoned and practical: "Wear your hat."

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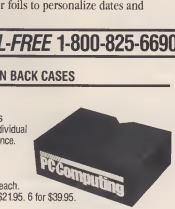

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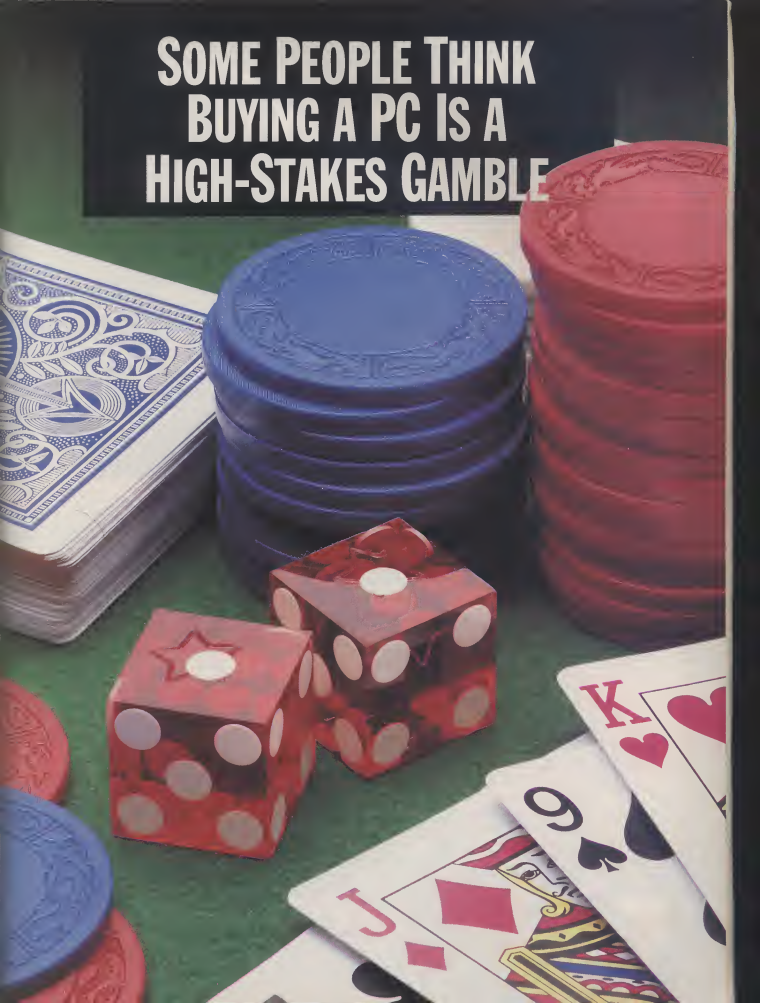

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1. Please rank the *three* factors (1 is highest) that make a software program most usable.

____ Ease of installation
____ Ease of learning
____ Complete, well-written documentation
____ Context-sensitive online help
____ Pull-down menus
____ A Windows interface
____ Intuitive operation
____ Shortcut keys, buttons, and icons
____ Other (please specify): _____

2. Please rank the *three* factors (1 is highest) that make a hardware product (system, printer, modem, and so on) most usable.

____ Ease of installation and setup
____ Easy-to-open case
____ Complete, well-written documentation
____ Clearly labeled, easy-to-reach controls
____ Troubleshooting instructions
____ Intuitive operation
____ Low maintenance requirements
____ Online help
____ Other (please specify): _____

3. In your experience, what is the *most usable* software program? Why? _____

4. In your experience, what is the *least usable* software program? Why? _____

5. In your experience, what is the *most usable* hardware product? Why? _____

6. In your own experience, what is the *least usable* hardware product? Why? _____

Fax your response to us (no cover sheet required) at (415) 578-7029; mail it to Fax Poll, *PC/Computing*, 950 Tower Lane, 20th Floor, Foster City, CA 94404; or send it via our PC/Contact service on CompuServe at 76000,21. Please respond by January 25, 1993.

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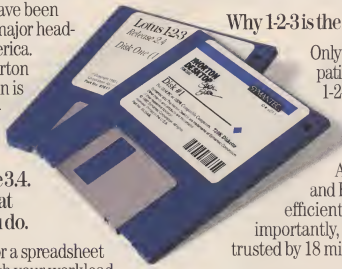

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DOS

Keys to Successful Hard Disk Management

EVEN A GIGABYTE IS NOT ENOUGH. LACK OF HARD DISK ORGANIZATION COULD TURN YOUR MEGABYTES INTO AN UNMANAGEABLE MESS. **BY JEFF PROSISE**

THE LARGER YOUR hard disk, the more important it is to organize it properly. There are efficient and inefficient ways to do this, and the vast majority of hard disks today could be tidier. Though there is no best way to clean up your hard disk, the following tips can help you organize it optimally and make the files stored on it easier to access.

Back to the Root

An important first step in organizing a new hard disk (once it has been partitioned and formatted) is to set up a system of subdirectories in which to store files and application programs. Keep the root directory as clean as possible. It must contain three files—CONFIG.SYS, AUTOEXEC.BAT, and COMMAND.COM. Almost everything else should be in subdirectories.

Why should the root directory remain relatively free of files? One of the most compelling reasons is that the majority of hard disks can store no more than 512 file and subdirectory names in the root directory. The number you can store in subdirectories, on the other hand, is limited only by available disk space. If you try to store everything in the root directory, it runs out of space long before disk space runs out. If you receive "Out of disk space" error messages when your hard disk has many free megabytes, it may be because you've overloaded the root directory.

The most pragmatic way to organize subdirectories is to set up one subdirectory for each major application program that you use, and then create data directories that are descendants of the application directories. For example, suppose you use WordPerfect 5.1 and have a subdirectory named WP51 in your hard disk's root directory. You could create three subdirectories named MEMOS, LETTERS, and DOCS inside the WP51 directory, and then install WordPerfect's program files in \WP51 and store memos in \WP51\MEMOS, letters in \WP51\LETTERS, and other word processing documents in \WP51\DOCS.

Of course, not all programs are major applications. Create a \UTIL directory to store important utility programs and a \MISC directory to store files that don't fit neatly into any of the other subdirectories. Sometimes it makes sense to store programs two levels deep in the subdirectory structure. If you have a \GAMES subdirectory for your after-hours software, create subdirectories for individual games. For example, install Flight Simulator in \GAMES\FS, Carmen Sandiego in \GAMES\CARMEN, and so on. Structuring a hard disk this way reduces clutter in the root directory and also ensures that you won't confuse the files associated with one program with the files of another.

The PATH Statement

Once you create the subdirectories, the next step is to set up a PATH statement in AUTOEXEC.BAT that allows you to run applications without switching into the directories that hold them. A typical PATH statement looks like this:

```
PATH=C:\DOS;C:\WP51;C:\UTIL
```

With this setup, you can run any program in the \DOS, \WP51, or \UTIL directory of the C: drive no matter what directory you execute it from. (You should always include drive letters in the PATH statements so that you can start programs from other drives.) For example, to edit a WordPerfect memo in \WP51\MEMOS, switch to \WP51\MEMOS and type WP to start WordPerfect. Because the PATH statement includes C:\WP51, DOS finds WP.EXE and executes it.

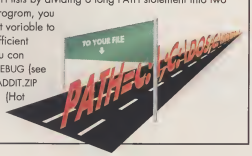
DOS users may encounter the 127-character limit on PATH directory lists. Avoid running out of PATH space with

DOS Helper

PCContact

ADDTOIT.COM

An easy way to circumvent the DOS path length limit is to use ADDTOIT.COM. ADDTOIT lets you create long PATH lists by dividing a long PATH statement into two or more commands. Using the program, you can extend the PATH environment variable to any length as long as there is sufficient environment space to hold it. You can either create ADDTOIT by using DEBUG (see Q&A, page 268) or download ADDIT.ZIP from PC/Contact's data library 1 (Hot Tips/Secrets).



the SUBST command, available in DOS 3.1 and later versions. Rather than enter the PATH statement shown in the preceding paragraph, enter the following commands:

```
SUBST G: C:\DOS
SUBST H: C:\WP51
SUBST I: C:\UTIL
PATH=G:\;H:\;I:\
```

Now G:, H:, and I: are equivalent to C:\DOS, C:\WP51, and C:\UTIL, respectively, and you've reduced the length of your PATH list from 22 characters to 11. The longer the subdirectory names (and the more there are), the more characters this little trick will save you.

Note: You must also add to your CONFIG.SYS file a LASTDRIVE command that's equal to the highest drive letter used by a SUBST command, or DOS won't recognize the drive; in this example, it's LASTDRIVE=I.

For a Better Environment

Along with PATH lists, DOS stores SET strings and PROMPT commands in the environment, an area in conventional memory. When these variables are expanded, they quickly deplete the available environment space.

If you add a subdirectory name to your PATH statement and subsequently receive an "Out of environment space" message from DOS, increase the size of the environment with a SHELL statement in CONFIG.SYS. The following command tells DOS that the command interpreter COMMAND.COM is located in the root directory of drive C: and that 512 bytes of environment space have been set aside:

```
SHELL=C:\COMMAND.COM C:\ /E:512 /P
```

The default for environment space depends upon which version of DOS you have—256 bytes for DOS 5.0, 160 bytes for earlier versions. If you need more than 512 bytes, increase the number following the /E switch—but not more than necessary, or you'll take away precious conventional memory. Don't forget to include the /P switch, which tells DOS to run your AUTOEXEC.BAT file when you start up.

/// Hot Tips /// PC Contact

Once Is Never Enough

Frazzled by having to key in command after command to get just a few things done? Keep your fingers healthy and avaid making annoying mistakes with this easy-to-use program that processes up to eight files. Use it to copy, delete, or list files with different extensions on different drives. It will also run most internal or external DOS commands and programs.

To create the program, enter the following lines in a text editor and save the file as MANY.BAT.

```
@ECHO OFF
IF %1X == X GOTO HELP
IF %2X == X GOTO HELP
ECHO About to execute "%1".
PAUSE
FOR %%X IN (%2,%3,%4,%5,%6,%7,%8,%9) DO %1 %%X
GOTO END
:HELP
ECHO SYNTAX: MANY [command] [[drive[path]]file1-8]
ECHO EXAMPLE: MANY DEL C:\*.BAK C:\*.BK1 C:\*.BK2 C:\*.TMP
:END
```

From the DOS prompt, type MANY fallowed by the desired command and a list of files or extensions you want to process. MANY.BAT accepts any combination of file extensions, wildcards, and drive letters but won't accept any parameters or destination directories. For example, to copy all the document files in your LETTERS directory to a directary called DOCS, you must first change to the DOCS directory and type:

```
MANY COPY C:\LETTERS\*.DOC C:\LETTERS\*.TXT C:\LETTERS\*.WP
```

MANY.BAT works with DIR, COPY, DEL, ECHO (to produce a list of files), TYPE, and any COM or EXE files that don't require source and destination filenames. Don't try to use MANY.BAT with other batch files—running another batch file will not return control to MANY.BAT, since MANY.BAT is a batch file itself.

DEBORAH NORLING

Shorten Your Path

Is your DOS PATH statement approaching its maximum 127-character length? You may be able to shorten it. Add two periods and a semicolon (..;) to the beginning of your PATH statement, and the DOS search path points to the parent directory of your current directory, no matter what the current directory is. Take, for example, the following PATH statement:

```
PATH = ..;C:\DOS;C:\WINDOWS
```

With this path in effect, you can start programs from directories that are not explicitly mentioned. From C:\PROGRAM\DATA, for example, you could start C:\PROGRAM\PROGRAM.EXE. Enter the same command—PROGRAM—from C:\PROGRAM\DATA\NUMBERS, and the program won't load because the path points to the parent directory of the current directory.

DEAN J. LOTITO

CONTINUED ON PAGE 232

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Hot Tips

CONTINUED FROM PAGE 231

Terminate Tenacious Temporary Files

Practice good hard disk management and remove unwanted files with this batch file that deletes all backup and temporary files in one command. To set up this simple system, you need to create two files. In DOS 5.0's EDIT, enter the following lines, and save the file as EDITBAK.LST. *Note:* To generate the ^Z character, press Ctrl-P, Ctrl-Z rather than the caret symbol followed by the letter Z.

```
1 R A ^Z DEL
R A ^Z DEL
E
QUIT
```

Next, type in the following lines and save it as CLEANUP.BAT.

```
@ECHO OFF
IF [%1] == [] GOTO INFO
FOR %%A IN (BAK Bak bak TMP Tmp tmp $$$) DO IF %1 == *.%%A
  GOTO RUN
ECHO Invalid parameter(s)
GOTO INFO
:RUN
ECHO Searching directories to delete %1. . .
ATTRIB +A -H -R \%1 /S
ECHO @ECHO OFF > C:\BAKLST.BAT
ATTRIB \%1 /S >> C:\BAKLST.BAT
EDLIN C:\BAKLST.BAT < C:\EDITBAK.LST > NUL
CALL C:\BAKLST.BAT >NUL
DEL C:\BAKLST.B??
ECHO DONE!
GOTO END
:INFO
ECHO Cleanup deletes *.BAK, *.TMP, or *.$$$ from all directories
ECHO of any drive. Use the syntax:
ECHO CLEANUP *.ext
:END
```

To run the program, type CLEANUP followed by the asterisk (*), which is the wildcard character, and the extension of the files you want to delete. For example, to delete all the files with the extension .BAK, enter CLEANUP *.BAK; the program does the rest. Repeat the command for any of the three extensions included in the batch file: .BAK, .TMP, and .$$$.

The batch file uses ATTRIB to search your entire drive for files with the specified extension and remove hidden and read-only attributes from the files so they can be deleted. Next, ATTRIB performs the search once more, and the program redirects the result of this search to a file. Then, DOS's EDLIN uses EDITBAK.LST to edit the file and add the DEL command to the beginning of each line that corresponds to a file. The program saves this text file as a batch file, which then runs and deletes the relevant files. Finally, the program deletes the batch file it created during its run.

Customize the program by editing the batch file and replacing any of the three extensions in line 3 with a different extension. Make sure you include all case variations when you make your substitutions (BAK, Bak, bak) so you won't have to worry about case sensitivity when you run the program. Also, if you don't want your hidden and read-only files deleted, remove the -H and -R from line 7 of the batch file—doing this will keep these attributes intact.

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Fast Printing Direct to Port—Just How Fast Is It?

A STOPWATCH PROVES THE SHORTEST ROUTE BETWEEN PC AND PRINTER IS NOT ALWAYS DIRECT.

BY CRAIG STINSON

A FUNNY THING happened on the way to this month's column. I had intended to explain the Fast Printing Direct to Port option listed under Printers in the Control Panel, and to reveal the function of the LPT1.DOS, LPT2.DOS, and LPT3-.DOS printer ports that Windows 3.1 installs on most systems. The direct-to-port printing option supposedly gives your data a faster ride to your output devices—its only downside is the potential incompatibility with certain applications and rare hardware configurations. Windows 3.1 installs the port names with the .DOS extension for the benefit of users who can't take advantage of the direct-to-port printing feature.

I thought it would be worthwhile to explain this feature and (especially) to quantify its benefits. But in stopwatch tests on my system, the effects of direct printing ranged from marginally negative to dramatically negative.

Sailing Straight into Port

First, a word or two about direct-to-port printing. Applications running in DOS have three ways of sending data to a parallel printer port. The most common way is for the program to call one of the DOS file-access services provided under the umbrella of Interrupt 21h. The INT 21 routine then makes a call to a BIOS routine (Interrupt 17h), which passes the data to the appropriate hardware port. A slightly more direct but less commonly used procedure is for the program to go straight to the BIOS routine, skipping INT 21. The most direct way is to send the data straight to the hardware port, bypassing both the DOS services and the BIOS routine.

Because DOS applications can't determine the addresses of your printer ports with certainty, the direct route is almost never used. Windows, however, generally does know exactly where your ports are stationed. It would seem that the best printing method is to bypass BIOS calls and DOS services and go straight to the LPT port of your choice, which is the method Windows uses for all parallel printer ports. (Of course, there's a way to bypass the default setting: Run the Control Panel, choose Printers, select the printer whose setting you want to examine or change, and then click on the Connect button. Deselect the check box in the lower left corner of the dialog box.)

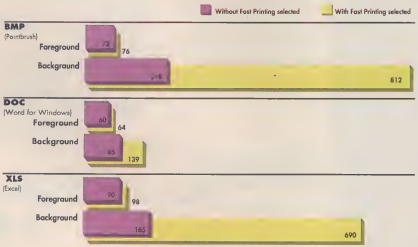
In rare situations—for example, with certain unsupported network configurations—direct-to-port printing may not work. Under these circumstances, you can deselect the Fast Printing option to force Windows to route your data through the standard DOS services. Alternatively, you can connect your printer to one of the ports by using a DOS extension.

If you choose a port name that ends with a period and a filename extension, Windows assumes that you're printing to a file rather than to a hardware device and accordingly passes your data off to DOS. But DOS treats any filename beginning with LPT1, LPT2, or LPT3 as a device rather than as a disk file. So, if you assign your printer to LPT1.DOS instead of LPT1:, INT21 manages the output and sends it over the first parallel printer port—just as you would if you simply deselected the Fast Printing check box. The characters used in the filename extension are irrelevant; only the characters to the left of the period matter. LPT1.DOS, LPT1.OS2, and LPT1.XYZ would all produce the same results.

Not So Fast

So much for theory. Just how fast is fast printing direct to port? The accompanying table tells the story, at least as it un-

Direct Printing in the Background Crawls



Time measured in seconds

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Circle 217 on reader service card.

folded on two test systems (a 486/33 and a 386/25, each running DOS 5.0).

I tested three files and three applications: a bitmap printed from Paintbrush, a text file printed from Word for Windows, and a chart printed from Excel. I printed each file two ways: once with the application running in the foreground (FG) and nothing else going on, and once with the printing app in the background (BG) and a screen-intensive Excel macro running in the foreground. All trials were performed on a Hewlett-Packard LaserJet Series II over LPT1, with a SmartDrive cache reset to empty and Print Manager set for medium priority. In each case, I recorded the time elapsed from the point when I issued the print command until the last page dropped into the tray.

As the table shows, when the printing application was in the foreground, the direct-to-port method took slightly longer in all cases than the old-fashioned DOS methods. This was surprising enough. But the real shocker was the difference in printing times when the Excel macro ran in the foreground. Under these conditions, the direct approach took much longer—1.6 times as long for the text file, and about 4 times as long for the two graphics files.

The Reason Why

So why is "fast" printing slower? The explanation is this: When you print direct to port, Windows is managing the time slicing all by itself. When you print via the DOS interrupts, DOS gets into the picture, and Windows yields a bigger share of the computer's processing time. What we have here is a high-tech version of the fable about the tortoise and the hare. The hare (direct-to-port printing) relinquishes processor control more frequently than the slow-but-sure tortoise does and therefore arrives late at the finish line.

In any event, the moral of my tale is that all claims regarding Windows performance—even if they come from official Microsoft documents or magazine pundits—should be taken with a sack of salt. Test alternatives on your own system to see what works best for you. The Windows manuals and help files say that bypassing the DOS interrupt will print documents faster. But, to quote Ira Gershwin, it ain't necessarily so.

Hot Tips

Words, Words, Words

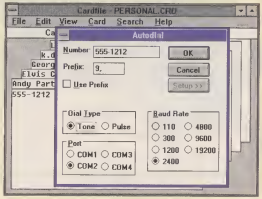
Confused about Windows terminology? Windows 3.1's Program Manager has a glossary that could clear things up. From Program Manager, choose Help, Contents. Click on the Glossary button. (If you don't see it, choose File, Open, select GLOSSARY.HLP from your Windows directory, and click on OK.) The Glossary window is a listing of various Windows terms, ranging from the elementary (*arrow keys, click*) to the technical (*time slice, virtual printer memory*). To see a definition, click on a term. When you're done reading the definition, click anywhere on the screen to return to the list of terms.

MATTHEW LAKE

Let Windows Do the Walking

If your telephone shares a line with your Hayes-compatible modem, let the Windows accessory Cardfile dial the phone when you want to call someone. Start Cardfile and choose Card, Add (or press F7) to begin a new card. Enter the name (last name first) you want the card indexed by, and click on OK. Then enter a phone number, without any outside-line prefixes, an the first line of the card. Type in any other information you want below the phone number. Choose File, Save to save the Cardfile for later use.

To use Autofile, Cardfile's dialing feature, pick a card. Select the phone number if it's not on the first line, then choose Card, Autodial or press F5. The first time you use Autodial, you need to click on the Setup button to specify tone or pulse dialing and your modem's location and speed. If you need to add a dialing prefix to the number, enter it in the Prefix: box and make sure that Use Prefix is selected. (You can change these settings at any time by clicking on the Setup button before dialing a number.) Verify that the phone number is the one you want, and click on OK. Cardfile will dial the number and prompt you to pick up the phone. After you pick up the handset, click on OK to hang up the modem.



With Cardfile and the Clipboard, you can even make Windows dial phone numbers from any Windows application. Simply copy the phone number to the Clipboard, switch to Cardfile (or start it if it isn't already running), and paste the phone number an a blank card (choose Edit, Paste). Then press F5, verify that the number and the settings are correct, and click an OK. After you've dialed the number, exit Cardfile, and answer no to the question "Save Current Changes?" unless you want to add the number to your cardfile.

RONALD W. GAMACHE

PIF Parameter Power

The PIF Editor in Windows 3.1 makes it easy to set up DOS programs or batch files that accept command-line parameters so that you can run them from the desktop. You use PIF Editor to create program information files (PIFs) that tell Windows how to run DOS programs. PIF Editor's Optional Parameters box is

CONTINUED ON PAGE 238

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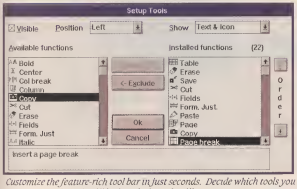

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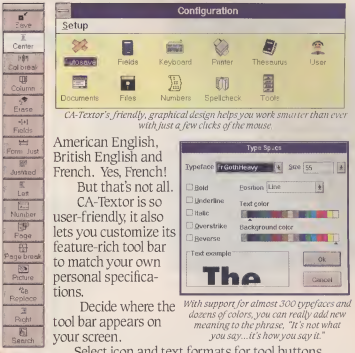

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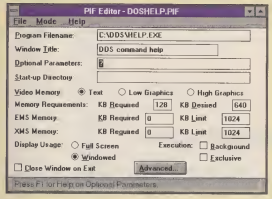
Hot Tips

CONTINUED FROM PAGE 236

where you put the optians that ordinarily fallaw the program name when you run it fram the command line. Either fill them in as yaa create the PIF file (ta start the program with the same parameters every time), ar enter ? ta have Windows prampt yau far parameters whenever yau run the program.



Ta see how this warks, create o simple PIF file ta launch DOS 5.0's HELP command. Since HELP accepts a single parameter—the name of anather DOS command—yau'll want Windaws ta prampt yau far that parameter each time yau run DOS HELP fram Windaws. First, apen PIF Editar and enter C:\DOS\HELP.EXE in the Program Filename bax. Enter DOS COMMAND HELP in the Windaw Title bax, and put a ? in the bax labeled Optianal Parameters. Chaase Display Usage, Windawed, and clear the Clase Windaw an Exit check bax (atherwise the DOS windaw will clase before yau have a chance ta read what's in it). Then chaase File, Save, and save the new PIF file in yaur Windaws directary as DOSHELP.PIF.

Fram Program Manager, chaase File, New ta create a new program item. Click an Brawse, select DOSHELP.PIF, select an ican, and click an OK ta return ta Pragram Manager. When yau want help with o DOS cammand, daable-click on the DOS Cammand Help ican. A windaw paps up requesting parameters far the pragram. Type DIR (ar any ather DOS cammand far which yau need help) and click an OK. The DOS HELP cammand takes aver and kicks up an explanatian of the cammand yau chase. The listing will remain an yaur screen until yau clase the windaw by daable-clicking an its cantral-menu bar ar pressing AltF4.

TODD BENSON

Documents on Your Desktop

With Windaws 3.1, it's easy ta put document icans anywhere an yaur desktap sa that yau can laad files (and their applicatians) withaut having ta warry abaut their filenames. The anly incanvenience this technique couses is that the document's file extensian must first be assaciated with its parent applicatian sa that Windaws knaws haw ta handle it. Mast Windaws applicatians create their awn associations when yau install them, but if yau use yaur own file extensions yau'll need to create associations, taa.

Open File Manager, select a document with the appraprate extensian, and chaase File, Associate. Fram the Associate with: bax, select the applicatian that created the file. If yau can't find it in the list af applicatians, yau can click an Brawse and select the applicatian's pragram file. Then click an OK ta return ta File Manager. All filenames that cantain the extensian yau just used will naw be associated.

Ta create an ican far o file, apen File Manager and change ta the file's directary. Click an the filename and drag it anta the graup in Pragram Manager where yau want the ican placed. Double-click an the resulting ican ta launch the parent application and load the document in a single step.

JOHN TASCHEK

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EXPERT ADVICE TO HELP YOU TAP THE HIDDEN RESOURCES OF POPULAR APPLICATIONS AND UTILITIES

QUATTRO PRO

TAKE A NOTE

Need to jot down some notes in a worksheet? Don't waste time adjusting cell widths and adding hard returns—use this reformatting macro instead. To create the macro, enter '\R in a cell and enter the following string of commands in the cell to its right:

```
~/SC65~/TR~{END}{DOWN}{EDIT}
```

Place the cursor on the cell containing '\R, and choose /Edit, Names, Labels, Right and press Enter to label the macro. To write a quick note, place your cursor in any cell and type until the computer beeps to tell you its input-line buffer is full. (This will happen just past the center of the fourth input line.) Now press Alt-R to activate the macro.

The macro places the contents of the input line in the current cell and then expands the column width to 65 characters. (If you want a wider margins, change the 65 in the macro to a larger number.) Next, the /Tools Reformat command breaks the text into lines and puts each line in its own cell. Finally, the macro moves to the cell containing the last line of text and places you in edit mode so that you can continue typing. If the new cell fills up, just press Alt-R again to reformat it.

To start a new paragraph, press Alt-R once and the down arrow twice. This places a blank cell between paragraphs and positions the cursor to start the next one. It's a snap to export the text for use in a word processor, but you'll have to strip out hard returns at the end of each line. (See "Remove Redundant Returns" under WordPerfect, page 250.)

MARK COLEN
APTOS, CALIFORNIA

1-2-3

SPACED-OUT SPREADSHEETS

Adding a blank column between two sets of numbers makes your spreadsheet more legible, but inserting the column may throw off some of your formulas.

To avoid this problem, make the first column of the second set of numbers wider. Select /Worksheet, Column, Set-Width and then use the arrow keys to adjust the column width. Because numbers are right-aligned, the spreadsheet will look as if there's an extra column before the data.

JONATHAN B. BAKKER
NEW YORK CITY, NEW YORK

AVERT MACRO MANAGER MISHAPS

Beware of libraries containing macros that load and process worksheets when you're using the Macro Library Manager in 1-2-3 Release 2.3. If any of the files you're opening have macros that execute automatically, they'll take

Pro Tips: Spreadsheets

KEEP UP WITH RUNNING TOTALS

I WANT TO KEEP YEAR-TO-DATE TOTALS IN MY WORKSHEET SO THAT WHENEVER I ADD AN ENTRY, THE NEW TOTAL REPLACES THE OLD ONE. HOW CAN I KEEP A RUNNING TOTAL WITHOUT HAVING TO SAVE ALL THE WEEKLY VALUES I'VE ENTERED THROUGHOUT THE YEAR?

RAY GIGLIO
WASHINGTON, D.C.

Calculating a year-to-date total is tricky when you don't want to retain the accumulating values. One approach is to write a formula that adds each value entered in one cell and places the cumulative total in another cell. For example, consider the following worksheet. Each week you enter sales totals in column B, and you want these values added into the running totals in column C.

	A	B	C
1	Item	Week	To Date
2	Inflations	137	+B2+C2
3	1.25" Tubes	90	+B3+C3
4	Spokes	777	+B4+C4
5	26" chains	108	+B5+C5

One way to manage updating column C in 1-2-3, Excel, and Quattro Pro is to write formulas in column C that employ circular references. A circular reference or formula is so named because it adds the result of its own calculation to the current cell value. For example, the circular formula in cell C2 of this worksheet is +B2+C2.

To use circular references, first set your spreadsheet to manual recalculation to prevent calculations on accidentally entered data. In 1-2-3, select /Worksheet, Global, Recalculation, Manual. In 1-2-3 for Windows, select Tools, User Setup, click on Recalculation, click on the Manual radio button, and click on OK to close each dialog box. In Quattro Pro for DOS, select /Options, Recalculation, Mode, Manual, and quit both menus. In Quattro Pro for Windows, choose Property, Active Notebook, click on the Manual button in the Mode box, then click on OK. In Excel, select Options, Calculation, Manual. Then select Iterations to change the number of iterations to 1.

Set up your formulas in column C by entering +B2+C2 in cell C2, and copy the formulas into the cells below it. With Excel, place individual formulas in the corresponding cells or place the original formula in a blank cell not on the worksheet and copy the formula from there. With the formulas in place, enter the week's sales totals in column B. Press the Calc key (F9) to add the new entries to the running totals.

Don't press Calc without updating all the current week's values. If you recalculate the worksheet a second time, the formulas add the current week's entries to the running totals again, and your data calculations double. To avoid accidentally adding values twice, promptly erase the week's entries after you calculate the running totals. To retain the records, move them to another column. Save the worksheet with the latest running totals, and retrieve it the following week to enter new sales figures.

Daniel Castelger

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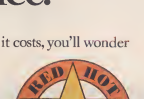

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control from Macro Manager and not return it.

The best solution is to disable the automatic macro in each worksheet. To find out which files have automatic macros, open each one, press the Goto key (F5), and enter \0 (backslash zero) as the destination.

If you get an error message, there is no automatic macro in that worksheet. Otherwise, select /Range Name Delete and enter \0 in order to remove the macro.

RONNY RICHARDSON
CHAMBLEE, GEORGIA

1-2-3 FOR WINDOWS

COPY DATA TO AMI PRO

SmartIcons in 1-2-3 for Windows and Ami Pro make it a snap to copy data from a spreadsheet into an Ami Pro document. In 1-2-3, select the area of the spreadsheet that you want to copy, and click on the Copy to Clipboard SmartIcon, or select Edit, Copy. Then switch to Ami Pro, or launch it if it isn't already running. Create a table (choose Tables from the Tools menu) with at least as many columns and rows as the data you copied to the Clipboard. Place the insertion point in the first cell to receive the data, and click on the SmartIcon that pastes the contents of the Clipboard. All data is transferred into the Ami Pro table—minus the formatting it had in the spreadsheet.

To automatically update the data in Ami Pro every time you change the spreadsheet, choose Paste Link from the Ami Pro Edit menu instead of clicking on the Paste SmartIcon. This creates a dynamic data link, so any changes to the table in 1-2-3 are reflected immediately in Ami Pro as long as both applications are loaded. If you change the original spreadsheet while Ami Pro isn't running, you'll get the message "Update DDE links in this document?" the next time you open the Ami Pro table. If you answer Yes, Windows attempts to launch 1-2-3 and load the source file for the table. This attempt will fail if the 1-2-3 directory is not in AUTOEXEC.BAT's PATH statement.

RICARDO DORSON
LOUISVILLE, KENTUCKY

EXCEL

1-2-3 SPOKEN HERE

Making the transition from 1-2-3 to Excel? Want to try a 1-2-3 Software Secret in Excel? Both Excel 3.0 and 4.0 can interpret 1-2-3 keystrokes. Select Options, Workspace and choose Lotus 1-2-3 Help. Check that the Alternate Menu or Help Key box contains a slash (/), and click on OK to return to the worksheet. When you press the slash key, a Help for Lotus 1-2-3 Users dialog box pops up. Select

///Pro Tips: Word Processing///

MAKE HYPERTEXT HAPPEN WITH WINWORD

OUR COMPANY'S SERVICE REPS SPEND A LOT OF TIME SEARCHING FOR TECHNICAL INFORMATION IN PRINTED MANUALS WHILE CUSTOMERS WAIT ON THE LINE. WE'D LIKE TO SPEED UP THE PROCESS, PREFERABLY BY ACCESSING THIS INFORMATION IN WORD FOR WINDOWS. THE FIND FUNCTION SEEMS INEFFICIENT—IS THERE A BETTER WAY?

MARIA VAN BUREN
PASSAIC, NEW JERSEY

Try using Ward's hypertext Goto Buttons. A good example of Goto Button usage is in Word's CONVINFO.DOC file. When you double-click on the button for a particular topic, Word jumps to the relevant section of the document.

To create a Goto Button that your service reps can use to see information on a topic, gather all text related to that topic in a single place in your document, and insert a bookmark at the beginning of that section. For example, to insert a bookmark for the parts list, place the cursor at the beginning of the list; choose Insert, Bookmark; type PARTS; and click on OK. (Bookmarks aren't displayed in any Word screen view. If you need to rename or delete a bookmark, choose Insert, Bookmark; select the bookmark you want to change; and click on Delete to delete it or type a new name to rename it.)

Next, insert a Goto Button that will take you to that bookmark. Place the cursor near the top of the document or anywhere you want the button to appear. Choose Insert, Field; select Goto Button from the Insert Field Type box; and click on OK. Word inserts a {gotabutton} code in the document screen. If you don't see the code, choose View, Field Codes to display hidden field codes. Between the curly brackets and after the word *gotabutton*, add a space and type the name of the bookmark to which the Gata Button will take you, then another space and the text that users will click an to activate the button. The following field code creates a Goto Button that moves you to the Parts bookmark when you double-click on the message "Click here to see the parts list."

```
{gotobutton parts Click here to see the parts list.}
```

Goto buttons are inactive with field codes displayed, so to test the new button, turn the field codes display off by choosing View, Field Codes. All you see of the Gota Button is its message. Double-click on this text to go to the corresponding bookmark. To return to the Goto button, press Shift-F5 before you make any further changes. (If you routinely edit text befare returning to a Goto button, you may find it convenient to create a Gato button and bookmark that take you back to the original location.)

Don't limit yaurself to plain text for your hypertext buttons. You can insert objects instead of the Goto Button message text. The Goto buttons in CONVINFO.DOC are Microsoft Draw objects, but you can also insert Word Art objects, PCX files, ar other graphical elements. To create Goto buttons using Draw, first insert a Goto button code as described abave. Then turn field codes on (choose View, Field Codes), and select the message area of the Goto button code. Choose Insert, Object, Microsoft Drawing.

Use the text and shading functions ta create a graphical button in Microsaft Draw. Then choose File, Exit, and press Return. Click an Yes to update the document, and an MS Draw object cade will appear in the Goto buttan field. To use the button, choose View, Field Codes and double-click an the button you've drawn. Ta make changes to the Micrasoft Draw object, move the insertion point onto the button and choose Edit, Microsoft Draw Object.

George Beinhorn

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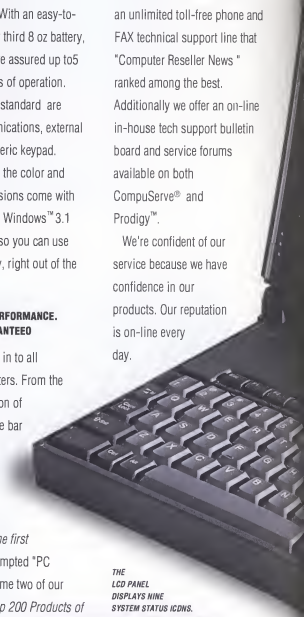

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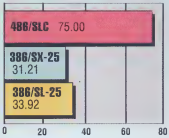

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486/DX2-50 $1995

■ 486DX2-50 processor ■ 64K cache ■ 4MB RAM ■ 105MB drive ■ 1.2MB & 1.44 MB drives ■ 16-bit SVGA with 1MB ■ Color SVGA monitor(1024 x 768, .28) ■ 1 parallel/2 serial ports ■ Upgradable processor ■ 200W power supply ■ 101-key keyboard ■ MS DOS ■ Windows and mouse

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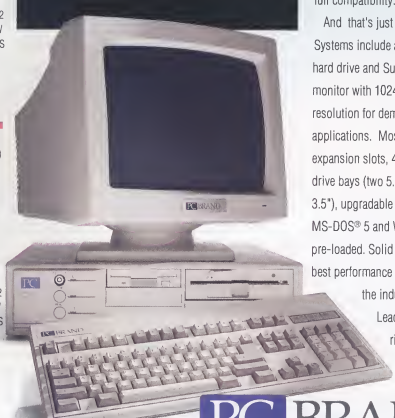
PCs WITH UNIVERSAL APPEAL.



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Hayes

6/92 2000-328

Demo in the Help Options section of the dialog box, then type the relevant 1-2-3 keystrokes or select the commands from the menu. When you press Enter to conclude the key sequence, Excel runs through its own menu structure to execute the equivalent commands. If this process is too fast or slow for you, press slash again to adjust the speed accordingly. Selecting a slower speed (1 or 2) is best when you want to watch the sequence to note how Excel does the job. To execute it quickly, choose 5.

Note: Help for Lotus 1-2-3 doesn't support commands for add-ins, such as Allways or Wysiwyg, although it does support them for Release 2.01.

RICARDO DOBSON
LOUISVILLE, KENTUCKY

HAVE A FIT

Is your spreadsheet too wide for a single sheet of paper? Using Excel 4.0's print-to-fit feature, you can reduce a spreadsheet's printed size so that it will fit neatly on one page.

Select File, Print Preview, then click on the Setup button. Click on the Fit to: button in the Scaling options group. Specify how many vertical and horizontal pages the spreadsheet should be printed on (choose 1 page wide by 1 page tall to print it on a single sheet). Then click on OK. Excel will shrink your spreadsheet until it just fits in the space you specified. To print the document at that size, click on Print.

WAYNE OHARA
MILPITAS, CALIFORNIA

QUATTRO PRO FOR WINDOWS

SLIDE SHOWS 101

Quattro Pro for Windows' onscreen slide show is the ideal way to show off a series of graphs. First, go to the graphs page—the final page in the Workbook file after tab IV—and use the left mouse button to drag a box around the graphs you want to include. To put slides in order or exclude graphs from the show, rearrange the graph icons before selecting them. When the graphs are selected, choose the Create Slide Show button on the SpeedBar. Enter a name for the show in the resulting box, and click on OK to create a slide show icon on the Graphs tab.

Edit the show by double-clicking on its icon to call up thumbnail graphs on the Light Table page. From this page, drag slides around to reorder them. Set transition effects, display time, and transition speed for each slide in the appropriate boxes. Highlight any slides that don't belong in the show and press Del to remove them.

To run a slide show, click on the Run Slide Show button on the SpeedBar. Select a slide show name from the Select Slide Show dialog box, and choose the OK button on the graph dialog box to start the show. Click the left mouse button to advance to the next slide, and click the right mouse button to go to the previous slide. To end the show, click the left mouse button from the last slide in the show or just press Esc. Return to the first worksheet by clicking on the Graph page button.

RICARDO DOBSON
LOUISVILLE, KENTUCKY

WORKSHEETS CONSOLIDATED

Consolidations of several worksheets in a notebook are straightforward with the SpeedSum button. First ensure that the worksheets you want to consolidate are adjacent to each other in your notebook, and place a blank worksheet (to hold the results of the consolidation) after your last data worksheet. Switch to the first worksheet you want to consolidate, and select the range to be consolidated. (The range must contain only numbers and formulas, since labels can't be added.) Then hold down the Shift key and click on the tab for the final, blank worksheet. An underscore appears beneath the tabs of the worksheets you've selected. Click on SpeedSum, and Quattro writes @SUM functions in the blank worksheet, adding together the selected cells in each consolidation worksheet.

For example, to add your January, February, and March worksheets together and put the results in the Quarter1 worksheet, first ensure that Quarter1 follows March. Select the data in January that you want to consolidate. Then hold down the Shift key and click on the Quarter1 tab. Click on SpeedSum to perform the consolidation.

ALISON PERRY
MADISON, WISCONSIN

WORD FOR WINDOWS

CUSTOM DICTIONARY

Tired of clicking on Ignore when spell-checking memos and other documents full of your co-workers' names? Create a custom dictionary containing their names so that the spell-checker won't give them a second glance. If you have a phone list in ASCII or Word format, open it; if you don't, make one. Put each word into a separate paragraph, and make sure each name is capitalized correctly. Choose Tools, Sorting. Ensure that the Sorting Order option is set to Ascending, and click on OK. Save the document in Text Only format as NAMES.DIC in the directory where all your custom dictionaries are stored (usually your WinWord directory). Then choose Tools, Options, Spelling. Select NAMES.DIC in the Custom Dictionaries list box, and click on OK. Now the spell-checker will flag a familiar name only when it's misspelled.

BILL FIELDS
PHILADELPHIA, PENNSYLVANIA

STAMPED CONFIDENTIAL

Ever wanted to stamp a document with a large diagonal Confidential, Draft, or For Your Eyes Only label? WinWord 2.0 makes it simple. If you have a PostScript printer, use the WaterMark macro. Open the file NEWMACRO.DOC (found in your WinWord directory). Select the WaterMark macro and click on Install to extract the macro. To add a stamp to a document, choose Tools, Macro; select WaterMark; and click on Run. A dialog box will prompt you for the text and style of the stamp.

For those without PostScript printers, follow these steps. First, select View, Header/Footer; choose Header; and click on OK. Next, select Insert, Object; choose MS WordArt; and click on OK. Enter a label (such as CONFIDENTIAL), pick a bold sans serif font, and change the fill to light gray.

Next, change the Style to Slant Up (More). Before exiting, increase the

Using Microsoft Publisher, Dan Matson trained his PC to do some pretty amazing tricks.

Dan Matson, owner and manager of *Animal House*, a pet store in Norwich, Connecticut, uses Microsoft® Publisher to do all of his newsletters, brochures, invoices, fax forms, business cards, coupons, etc.

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font size to 96 points and click on OK. Ignore the message that says that the current point size is too large, and click on OK again.

Next, choose Format, Page Setup, and set your margins, making sure that the top margin is a negative number (-1 inch if it was set to 1 inch, for example). The document is now ready to print. Check Print Preview to see how it will look.

SANDRA FARQUHAR
EDITORIAL ASSISTANT

WORDPERFECT

HARD RETURNS IN BLOCKS

If you've cut text using Alt-F4 (Block) and Ctrl-F4 (Move), you can't use Enter to insert a hard return before you paste the text block because pressing Enter will insert the block you've just cut. Instead, press Ctrl-V, Enter. This inserts a hard return, making room for the text to be inserted. Press Enter again to paste the block.

RAYMOND W. MCCAULEY III
COLLEGE STATION, TEXAS

QUICKEST DATE IN THE WEST

To insert a date in your document, press Shift-F5 (Date/Outline), 1 (Date Text). This inserts the date at the cursor. To change WordPerfect's date format (from 7 October 92 to October 7, 1992, for example) press Shift-F5, followed by 3 (Date Format). WordPerfect lets you customize the way the date is displayed. If WordPerfect inserts the wrong date, you need to adjust your computer's internal clock. At the DOS prompt, type DATE, press Enter, and enter the correct time.

THOMAS KNIGHT
WACO, TEXAS

REMOVE REDUNDANT RETURNS

Files imported into WordPerfect often have a [HRt] (hard return) at the end of every line and two at the end of each paragraph, which makes formatting changes such as margin adjustments difficult. WordPerfect's search-and-replace feature makes stripping out these extra hard returns easy. To preserve the original paragraphs, you need to remove all single hard returns without eliminating the double ones.

Replace each double hard return with a ~ (tilde) or any other character not in your document. Press Home, Home, up arrow to move to the top of the document. Press Alt-F2 (Search and Replace), and press N so that you won't have to confirm each replacement. Hit Enter twice to specify the text to be replaced (two hard returns), and press F2. Type a tilde at the Replace with: prompt, then press F2.

Now delete all remaining hard returns. Press Home, Home, up arrow

Pro Tips: Databases

PARADOX MANAGES MULTIPLE TABLES

I MAINTAIN TWO PARADOX TABLES—ORDERS AND CLIENTS—TO HANDLE ORDERS FROM MY CLIENTS. THE TABLES ARE LINKED THROUGH THE CLIENT-NUMBER FIELD IN ORDERS, WHICH I SET UP WITH A TABLE LOOKUP VALIDITY CHECK. BUT WHEN I TRY TO ADD ORDERS FOR NEW CLIENTS, I CAN'T UPDATE CLIENTS BECAUSE IT'S A LOOKUP TABLE. WHAT ARE MY OPTIONS?

PETER LINCOLN
ORLANDO, FLORIDA

If you are using a validity check to recall client records, all you can do to add a client is exit the ORDERS table, view CLIENTS (or press F3 or F4 to switch to it if it has already been viewed), add the client, and return to the ORDERS table. The best solution is to use Paradox's multitable feature, which lets you maintain linked tables and see them all onscreen at once.

Let's assume that your CLIENTS table has the fields CNUM and CNAME and that your ORDERS table has the fields CNUM, INVOICE, and AMOUNT. You first need to set up key fields to prevent duplication and to keep your table sorted by these fields: Select Modify Restructure Table, and choose CLIENTS. Key the field CNUM by placing an * (asterisk) to the right of the value. Next, restructure the ORDERS table and key the fields CNUM and CNAME by following the same procedure.

Create an ORDERS form, placing INVOICE and AMOUNT on a single line. To expand your form and show multiple orders, use the multirecord feature. To do this, create a form for the CLIENTS table by selecting Form Design Table and choosing CLIENTS. Select 1 (or a higher number), and give this form a description. Next, place CNUM on one line and CNAME on the next, move down to a blank line, and select Multi Tables, Linked, Place, ORDERS from the menu. Select the form number that you just created in CLIENTS, and link the forms to the CNUM field. Paradox will display a black that represents the linked ORDERS form. Move it into position, and you've completed your multitable form.

To add a new order, view the CLIENTS table, and use Image Pickform to display the new form. Page up or down to find the proper client. Paradox displays client records and their orders, if there are any, on the same screen. Use F3 (Down Image) and F4 (Up Image) to switch to the different parts of the form. For example, hit F4 to switch to the ORDERS part of the form, or press F9 to edit the table. Hit the Ins key to add a blank record, and fill in the order. Use F3 to move back to the CLIENTS section of the form to enter the next order. Paradox allows you to add clients without adding orders.

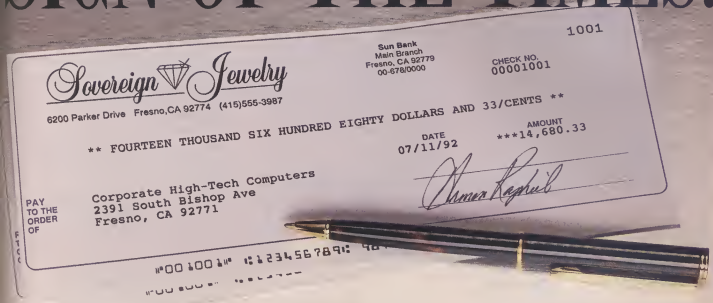
Paging through records is a tedious way to search for clients or client numbers. To create a script that uses the Alt-A keys to search for field values, use the Paradox script editor to edit INIT.SC, the Paradox startup script. If you don't have this script, choose Script Editor, Write from the menu to create INIT, and add the line

```
SETKEY -30 Do_It! EditKey Menu {Image} {Zoom} {Value} Enter " "
CTRLBACKSPACE
```

Restart Paradox, view a table, and hit Alt-A to search on any field. The script puts you in Edit mode when it finds the correct record. To search for, say, a client, place your cursor on the CNUM field in the form. Press Alt-A, and enter a client number. Press return, and Paradox moves you to the correct client. Press Alt-Z to search for the next matching record. If you can remember only part of a client number, add two periods (..) to your search value, and Paradox finds the closest match.

Mike Falkner

SIGN OF THE TIMES.



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to go back to the top of the document. Press Alt-F2, N, and press Enter once. Press F2 twice, and WordPerfect will delete every [HRt].

Finally, to restore the paragraphs, replace each tilde with a double hard return. Press Home, Home, up arrow. Then press Alt-F2, N, and type ~. Press F2, hit Enter twice, and press F2 again. Your document has been reformatted with a blank line between each paragraph and soft returns.

MARK COLEN
APTOS, CALIFORNIA

AMI PRO 3.0

FORMS WITHOUT FUSS

Ami Pro easily handles printing on preprinted forms. If you want to print on a form you've already created in Ami Pro, open the file that contains it. For other forms, create a table to duplicate the form you want to print.

Choose Tools, Tables and specify the number of rows and columns you want. Then adjust the row and column widths so that the table matches the form you'll be printing, and type in text identifying each cell you want to fill in. Adjust the table's size, fonts, and position on the page until it matches the original form.

When the form is finished, choose Table, Modify Table Layout. Then ensure that the Honor Protection box is not selected, and click on OK.

Select any cells that contain preprinted form labels. Choose Edit, Mark Text; select Protected Text; and click on OK. Fill out the information you want printed on the form. Then choose File, Print. Click on Options and select "On preprinted form." Click on OK to return to the Print dialog box, and click on OK to print the document. The protected text and the table's lines and fills won't be printed, but the rest of the text will be printed in the proper places on the form.

MOIRA MOYNIHAN
TOLEDO, OHIO

DBASE

SQUEEZE OUT SPACES

dBASE provides the LTRIM() function to remove leading spaces from a character string and RTRIM() to remove trailing spaces. But if you want a function that removes every space from a character string, use COMPRESS, a program that accepts a string from dBASE and deletes all spaces and tabs. To create COMPRESS, enter the following lines in a text editor and save the file as COMPRESS.SCR. Be sure to include a carriage return after the final *Q*.

```
N COMPRESS.BIN
E 0100 89 D9 8A 07 3C 00 74 21
E 0108 3C 20 74 04 3C 09 75 07
E 0110 80 00 88 07 43 EB EB 39
E 0118 CB 75 03 43 EB E2 89 DA
E 0120 89 CB 88 07 89 D3 41 EB
E 0128 E7 CB
RCX
002A
W
Q
```

At the DOS prompt, type DEBUG < COMPRESS.SCR and press Enter to create the program.

In the following example, after COMPRESS has been run, the variable COMP_STR contains "Nospaceleft" instead of "No spaces left."

```
comp_str = " No spaces left "
LOAD compress
CALL compress WITH comp_str
RELEASE MODULE compress
```

ROGER W. SAUER
FAIRFIELD, CALIFORNIA

Q&A

SHORTCUT TO SPECIFICATIONS

Get quick access to many field specification menus when you're designing a form or adding data to one in Q&A File. Press Shift-F9 for a menu that takes you to the screens that define many field specifications. Press F for the Format Spec screen, R for Restrict Value, I for Initial Values, T for a Field Template, P for a Program Spec, L to specify a Lookup table, H to define or modify Custom Help screens, or N for the Navigation Spec screen. Don't press Esc to leave these screens—you'll have to go all the way back to the File menu before you can return to your database. Instead, press F7, then F10 to retrieve all the records and return to Search/Browse mode.

PETER NORRIS
HOUSTON, TEXAS

DR DOS 6.0

ECHOING THE SOUND OF SILENCE

In MS-DOS batch files, an ECHO command without any following words or punctuation will produce a message that ECHO is either on or off—this is a nuisance at best.

However, under DR DOS 5.0 and 6.0, when you follow an ECHO command with two or more spaces, the batch file you're writing displays a blank line.

RONNY RICHARDSON
CHAMBLEE, GEORGIA

MCI MAIL

FROM HERE TO COMPUSERVE

You can send messages between MCI Mail and CompuServe, even if you don't have an account on both systems. To send a message from MCI Mail to CompuServe, create a new message. At the TO: prompt, just type the person's or company's name, followed by (EMS).

When the EMS: prompt appears, type COMPUSERVE. Then at the MBX: prompt, type the recipient's user ID in standard CompuServe format. For example:

```
TO: John Doe (ems)
EMS: CompuServe
MBX: 76543,1234
```

In order to send messages from CompuServe Mail to MCI Mail, enter the address in the following format, where 123-4567 is Jane Smith's MCI Mail ID:

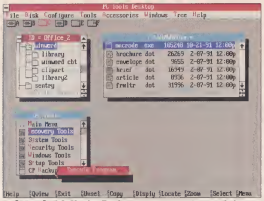
```
Jane Smith >MCIMAIL:123-4567
```

Note that the > character is part of the address and must be included.

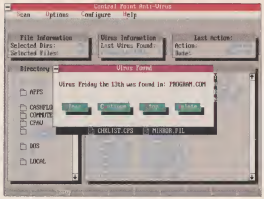
PETER NORRIS
HOUSTON, TEXAS

Do you know a better, faster, easier, or more effective way to use software applications? Share them with others, and if we publish your secret, we'll send you on "I've Got a Secret in *PC/Computing*" T-shirt. Send your tips, along with your name, address, and daytime phone number, to Software Secrets, *PC/Computing*, 950 Tower Lane, 20th Floor, Foster City, CA 94404. Please indicate your shirt size: S, M, L, or XL.

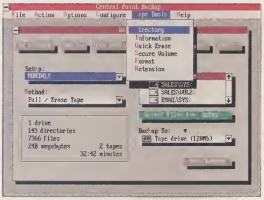
fig. [1]
Maslow's Hierarchy of Needs.



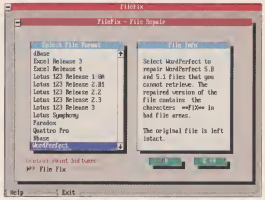
[New] *PC Tools™ Desktop gives you a drag-and-drop interface that makes file and program management easy.*



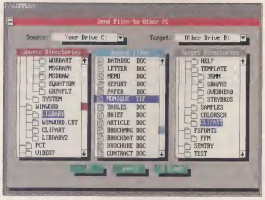
[New] *Detect and remove over 1,300 viruses with our complete Central Point® Anti-Virus program.*



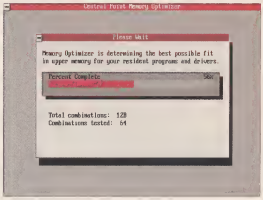
[New] *Central Point Backup® now supports SCSI drives and lets you format and erase tapes from inside the program.*



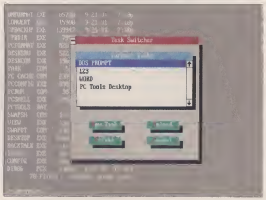
[New] *FileFix™ repairs more application files than ever before, including WordPerfect, Excel and Quattro Pro.*



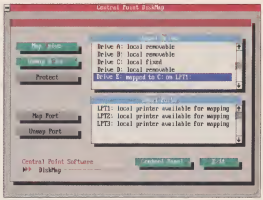
[New] *Commute™ runs faster Windows and DOS sessions and makes file transfers even more convenient.*



[New] *RAMBoost™ memory optimizer takes full advantage of DOS 5 and frees up more memory for your applications.*



[New] *Task switching lets you move between multiple DOS applications faster and easier.*



[New] *Remote disk and printer link allows remote disk drives or printers to appear as local resources on your PC.*

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Circle 249 on reader service card.

TIPS AND TECHNIQUES TO BRING OUT THE BEST PERFORMANCE IN YOUR PC AND PERIPHERALS

PRINTERS

DRUMS IN THE DARK

Laser printers that have Canon printer engines (like those in the LaserJet family) use replaceable cartridges that contain both toner and print drums. The drum is the light-sensitive element that the printer's laser electromagnetically charges with the image that's being printed. Although it's possible see this drum by flipping a couple of spring-loaded traps, resist the temptation to take a peek. The drum is sensitive to light the same way that photographic film is—once it's exposed to too much light, it's useless.

A drum that's exposed to a few seconds of direct light will probably be unharmed, but prolonged exposure to bright light results in printouts with horizontal bands of faded type. To be on the safe side, follow a few precautionary measures.

First, don't leave your laser printer open for long, exposing the electrophotographic, or toner, cartridge to the elements. Wrap electrophotographic cartridges in their original covers when removing them from a printer for long periods of time. And don't peek under any flaps on a cartridge unless it's already spent and ready to be recycled (not thrown out, of course).

MATTHEW LAKE
ASSOCIATE EDITOR

TAPE BACKUP

INDIRECT MEMORY ACCESS

Is your tape backup software's "high-speed" backup slow as a snail on Sominex? Or does it fail altogether? The problem is in the use of direct memory access (DMA) channels. High-speed DMA allows a program to use one DMA channel to read data from the hard disk and another to write data to a floppy disk drive or another device at the same time. Many backup programs (including Central Point, Fastback Plus, Fastback Express, Norton Backup, and Back-It) attempt to use the DMA channel to speed backups both to floppy disks and to tape drives.

However, the use of DMA channels is fraught with problems. On rare occasions, the motherboards of some PCs just two or three years old don't run in high-speed DMA. A more common cause of DMA problems is conflicts with Microsoft's Windows 3.1 video drivers. Mixed signals generated by video cards underequipped with memory—a 256K card, for example—interfere with DMA data processing. During floppy disk backup, the program thinks there is corrupted data and retransmits it, causing a loss of speed, unacceptably high error-correction rates, and in some cases, complete failure to perform.

There are several possible solutions to these problems: In Windows Setup, select and use the VGA driver for Windows 3.0; ask the manufacturer of your video card if a Windows 3.1 driver is available or if there is a newer release of your current driver. If money is not a problem and your

/// Hardware Checklist ///////

DIAGNOSE DUD FLOPPY DRIVES

You slip a floppy disk into its drive, start to access a file on it, and then the error messages begin. Next to power supplies and hard disk low-level formats, floppy drives have the highest failure rate of any PC hardware. The most common message—"General failure reading . . ."—is usually the result of a poor-quality or improperly formatted floppy disk. If your floppy drive problems go deeper, use this troubleshooting plan to find the solution.

Hardware Squints Try an eyeball test. Open your PC and compare the jumper settings of the problem drive with the documentation. Check to see that the data cables and power leads are properly connected at the drive and controller ends. It won't hurt to replace the floppy drive cables now, on the off-chance that the cable might be damaged.

Config this! Verify that your PC's CMOS setting is properly configured to the drive type and size. Check documentation (if you have it) for specific drive models and capacities, or contact your dealer for this information.

Sleuth your system. If the problems persist once you've determined that your software and hardware are set up correctly, run a diagnostic program (such as System Sleuth or Checkit) on both the controller and the drive to rule out the possibility that your controller is failing. If no errors are found, format a new, never-before-formatted floppy and try the operation again.

Shuffle the cards. If drive problems began soon after you installed a peripheral controller board, such as a new game card, remove all the controllers in your PC except your drive controller and video card. Then reinstall them one at a time, checking your floppy drive after each installation to see if a conflict exists between the drive controller and one of the controllers you removed. If this is beyond your technical expertise, take your system to a trained professional for service and repair.

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Circle 156 on reader service card.

video card is more than a year old, upgrade it—it will not only solve the DMA problem but also will probably run Windows faster.

A second symptom of DMA-compatibility problems is unacceptably high levels of error correction during backup. Some error correction is inevitable, but chronic errors often stem from DMA problems with a chip on the floppy controller card. There are two solutions: Get a new floppy controller card (but check with the tape drive manufacturer for guidance about incompatibilities) or get a controller card for the tape drive, which usually costs $100 to $150.

JAN SMITH
STAFF WRITER

MONITORS

BASIC SCREEN SAVER

Screen savers are neither new nor exciting, but their virtues are legendary. While you're away from your PC, a screen saver prevents the electron gun in your monitor's cathode ray tube from overstimulating the phosphors that coat the inside of your screen, which, over time, would reduce their luminosity and could cause characters to be burned into the screen. The classic screen saver is memory resident—and like any TSR, it hogs system resources and conflicts with most drivers and programs you want to run. The listing on this page contains an alternative called MARQUEE-.BAS, a QBasic program you can use to blank your screen or display a scrolling message of up to 79 characters (that is, a screen's width less one character).

You can either enter the listing in a text editor or save keystrokes by downloading MARQUE.ZIP from PC/Contact's data library 1 (Hot Tips and Secrets) and save it in a utilities directory on your DOS search path. To execute the program, enter the following line at a DOS prompt:

```
QBASIC /RUN MARQUEE.BAS
```

Since this line is a handful to enter every time you leave your desk, create a batch file that contains the command line and the path to MARQUEE.BAS, if it's in a different directory from the batch file. Give it a name that's easy to remember, such as MARQUEE.BAT.

While it's true that Windows 3.1 has a built-in screen saver with a fancier marquee-style message, there are advantages to setting up a screen-saving icon and running MARQUEE.BAS directly from Windows. For one thing, the Windows screen saver uses up system resources, which on many PCs are too precious to waste. Also, it takes six steps to open the Control Panel, change the screen-saver message, and save it. Click on a Marquee icon and dash off a message, and you can be out to lunch in seconds—without a system resource penalty.

DAVID RYGMYR
TECHNICAL MANAGER, MICROSOFT PRESS

LESS POWER TO YOUR DISPLAY

The "leave it on or turn it off" debate has raged without resolution since the early days of PCs. Those on the leave-it-on side say that powering up and down cathode ray tubes in monitors accelerates the aging of their components. But leave the monitor on, and whether there's a screen saver running or not, you'll triple its electricity consumption—and that means another $70 added to your electricity bill (based on a 150-watt monitor at 8 cents per kilowatt-hour). On most modern PCs (though not the original IBM PC or XT, among other models), you can safely turn off the monitor during the day while your CPU is busy chugging away at a database report or when you leave for lunch. This can reduce your annual electricity bill by some $20 per PC. However, before getting too enthusiastic, verify in your documentation that powering down your monitor when the PC is running will not damage your display card or your PC.

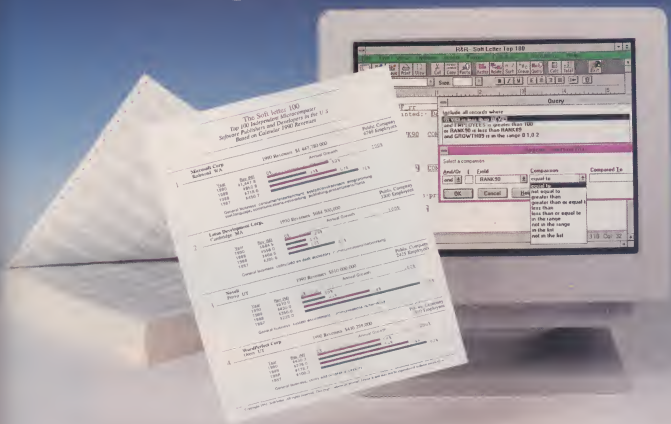
MATTHEW LAKE
ASSOCIATE EDITOR

MARQUEE.BAS

```
Delay% = 30000 : CLS : Blank$ = SPACE$(80)
LOCATE 10, 1
PRINT "Enter the message to display (up to 79 chrs, no commas): "
LOCATE 12, 1 : INPUT "", Msg$ : CLS : StrLen% = LEN(Msg$):
DO UNTIL INKEY$ <> ""
    FOR VPos% = 80 TO 1 STEP -1
        IF VPos% + StrLen% > 80 THEN
            Display$ = LEFT$(Msg$, (81 - VPos%))
            LOCATE 12, VPos% : PRINT Display$
        ELSEIF VPos% = 1 THEN
            FOR Ptr% = StrLen% TO 1 STEP -1
                Display$ = RIGHT$(Msg$, Ptr%): LOCATE 12, 1: PRINT Display$
                FOR Slow% = 1 TO Delay% : NEXT Slow%
                LOCATE 12, 1 : PRINT Blank$
            NEXT Ptr%
        ELSE LOCATE 12, VPos% : PRINT Msg$
        END IF
    IF INKEY$ <> "" THEN SYSTEM
    FOR Slow% = 1 TO Delay% : NEXT Slow%
    LOCATE 12, 1 : PRINT Blank$
    NEXT VPos%
LOOP
SYSTEM
```

Have you mastered your modem or monitor? Are you proficient with PCs and printers? Do you know how to get the most from your hardware? Share your secrets with others! If we publish your hint, we'll send you a *PC/Computing* T-shirt. Send your tips, along with your name, address, daytime phone number, and T-shirt size (S, M, L, or XL), to Hardware Hints, *PC/Computing*, 950 Tower Lane, 20th Floor, Foster City, CA 94404.

A new way to look at your data.



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Circle 322 on reader service card.

Parallel Ports

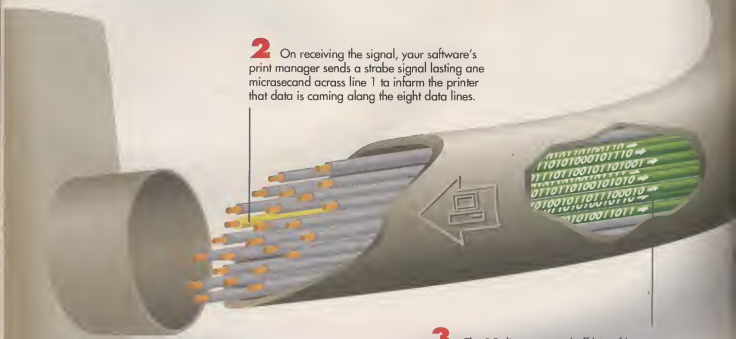
PCS AND PARALLEL PORTS PUMP INFORMATION EIGHT BITS AT A TIME WITHOUT MISSING A BEAT.

BY RON WHITE • ILLUSTRATION BY TIMOTHY EDWARD DOWNS

Centranics parallel transfer was designed ta send infarmatian to printers faster than the earlier serial system. Today it links PCs ta hard disks, backup devices, scanners, and athar PCs—and if's still faster than serial transfer, because instead af sending data ane bit at a time, parallel ports pump bits across eight wires at ance. But ta manage the process, parallel ports use mare than twice that number af wires. Some, such as line 14, are used to program the printer. The rest manage data transfer.

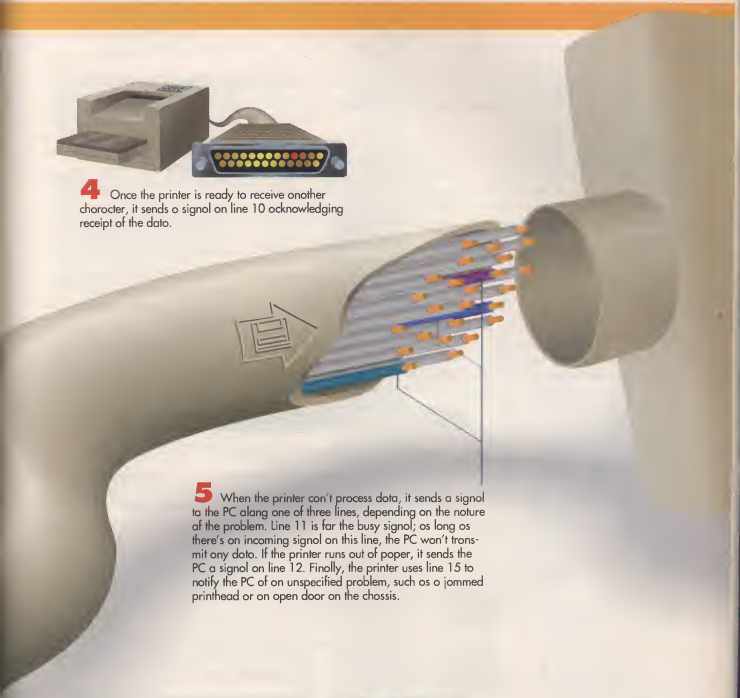
1 Befare a parallel transfer, the target device (usually a printer) must send a signal ta the PC alang the select line (number 13). This signal begins when yau turn the printer an and put it anline.

2 On receiving the signal, yaur saftware's print manager sends a strabe signal lasting ane micrasecand acrass line 1 ta infarm the printer that data is caming alang the eight data lines.



3 The PC directs an and aff bits af binary data to lines 2 thraugh 9. The an bit (1 in binary code) is a five-valt signal, and the aff (ar 0) bit is a zera-valt signal. Ta reduce line naise, each af the data lines has a graunding line numbered 18 thraugh 25.

4 Once the printer is ready to receive another character, it sends a signal on line 10 acknowledging receipt of the data.



5 When the printer can't process data, it sends a signal to the PC along one of three lines, depending on the nature of the problem. Line 11 is for the busy signal; as long as there's an incoming signal on this line, the PC won't transmit any data. If the printer runs out of paper, it sends the PC a signal on line 12. Finally, the printer uses line 15 to notify the PC of an unspecified problem, such as a jammed printhead or an open door on the chassis.

6 To conclude a parallel-transfer session, the PC can use signals on two lines. Line 16 resets the printer to its original state—as if the printer were turned off and back an again. With some printers, a signal from the PC along line 17 acts as an off switch, telling the printer to accept no more characters.

AUTHORITATIVE ANSWERS TO YOUR MOST PRESSING PC QUESTIONS. BY DALE LEWALLEN AND JEFF PROSISE

Zap-Proof Zero-Length Files

One of the subdirectories on my hard disk contains several zero-length files, which the DEL command won't remove. Where do these files come from? How come I can't delete them? And how can I create files that DOS can't remove?

L. KOSTER
SPRINGFIELD, NEW JERSEY

First things first: Zero-length files come from many sources. Some batch files create them to use as markers. For example, a batch file can use an IF EXIST command to determine whether the file has been run before. Zero-length files are also left on disk when a program crashes before it has time to write information into a file. You can even create them yourself: The command GOTO > NOFILE.TXT creates a file named NOFILE.TXT that is 0 bytes in length. Zero-length files aren't harmful, but they do take up 32 bytes of disk space—the length of one DOS directory entry containing the file's name, length, attributes, and location.

The DEL command probably didn't remove these files because their read-only or system attribute was set. To remove a read-only attribute, issue the command

ATTRIB -R *filename*

In DOS 5.0, you can also delete a system attribute with the command

ATTRIB -S *filename*

To protect your own files from DOS's DEL command, just type

ATTRIB +R *filename*

This marks the file as read-only, so any attempt to delete it will be met with the message "Access denied."

Another way to protect a file from deletion is to embed ASCII 255 characters in the filename. To create the character, hold down the Alt key and type 255 on your PC's numeric keypad. What shows up looks like a space, but to DOS it's a hard character. Try this experiment. Create a file named TEST.FIL. At the DOS prompt, type

REN TEST.FIL TEST<255>.FIL

where <255> represents the ASCII 255 character. Then type DIR. The file shows up in the directory listing as TEST.FIL. But now type DEL TEST-.FIL. DOS will respond with "File not found." To delete the file, you must enter the ASCII 255 character exactly as before. To the casual observer, who is unaware that the filename contains a nonprintable ASCII character, the file will appear to be unerasable.

Exercise Extra Line Feeds

I would like to use the EDIT utility included with DOS 5.0 to edit my batch files, but it has the annoying habit of adding an extra carriage return to the end of the file. The extra return triggers two prompts that are printed onscreen when the batch file ends. This bothers me, so I use another text editor. Is there a way to get EDIT to omit the extra carriage return?

BEN SEREBRIN
LAKELAND, FLORIDA

We, too, find this characteristic of EDIT annoying. Extra carriage returns show up as blank lines in the editing window, so often you don't even know they're there. But if you run a batch file and don't turn ECHO off, each extra carriage return produces one DOS prompt when the batch file ends.

Fortunately, you can get rid of the extra carriage return characters. Before exiting the editor, type Ctrl-End to move the cursor to the end of the file. If the file contains blank lines,

Help About...

MANAGING YOUR WINDOWS DESKTOP

I WANT TO TAKE ADVANTAGE OF WINDOWS' ABILITY TO RUN SEVERAL APPLICATIONS AT THE SAME TIME. THE PROBLEM IS THAT MY SMALL SCREEN QUICKLY FILLS WITH UNTIDY OVERLAPPING WINDOWS. ARE THERE ANY SOLUTIONS?

DON FONTANA
PARADISE, CALIFORNIA

You didn't mention your video hardware setup—so it's possible your current monitor can display more than the standard VGA's 640-by-480 resolution. Depending on the chip used in your video card, you might be able to get 800 by 600 pixels onscreen—around 50 percent more than standard VGA—just by using the appropriate video driver. Run Windows Setup and try changing the video driver.

You can also increase screen real estate by using software that provides a "virtual desktop." You can have many products loaded, each one occupying a single virtual screen that you can recall and display with a mouse click or keystroke. One of the best shareware implementations of this feature is in a program called BigDesk, which is available on PC/Contact, *PC/Computing's* CompuServe forum, as BIGDSK.EXE in data library 3 (Utilities/Misc.). Power Launcher 2.0 from hDC, which features a virtual desktop as well as a slew of other useful Windows utilities, sells for $99.95 (hDC Computer Corp., 206-885-5550).

PCContact

BBS Support: Hardware

Searching for updated drivers, solutions to installation problems, or advice on using hardware? Try the vendor's CompuServe forum or bulletin board service. Unless otherwise stated, the numbers listed operate at 2,400 bits per second, with modem settings of no parity, 8-bit transfer, and one stop bit (N-8-1). To access the CIS forums, log on to CompuServe and type GO followed by the forum name. Can't find a company on the list? Check CompuServe's Computer Club Forum (GO CLUB) or the IBM Users Network (GO IBMNET) for additional vendors.

This list will continue next month with vendors N–Z.

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Advanced Logic Research	(714) 458-6834 (14,400 bps)
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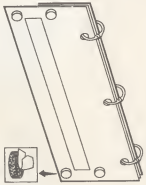
FastFacts

or heavy scissors to cut off the bottom part of the binder that fits over horizontally placed function keys. Discard the bottom, and the rest of the binder will fit on your keyboard.



■ After positioning the binder, make a note of four places on your keyboard to attach Velcro tabs to hold your binder in place. Peel the adhesive backing off one side of each of the four tabs, and press them into position on your keyboard. Then press the Velcro halves of each tab firmly together. Peel the remaining backing off the top halves of the tabs, and press your binder against the exposed adhesive surface.

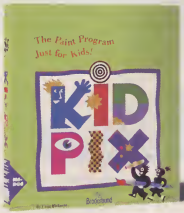
Our Paint Program Has A Big Bug In It.

In the interest of full disclosure, there is a big bug in our program—a big ladybug, to be precise. In fact, it's just one of the creatures crawling around in Kid Pix—the multimedia paint program designed especially for kids.

Because, like kids themselves, Kid Pix is loaded with surprises.

Erase a drawing and you're likely to turn up a bug, or even a lobster. Pick a letter and hear the talking alphabet read it back in English or Spanish. Draw, paint or use any of the 112 wacky rubber stamps and listen to Kid Pix gurgle, splat or kerrr-boing.

It's what we like to call sound thinking. And, at under $50, what we think you'll call a sound investment.



And Kid Pix is available in DOS, Macintosh® and Windows™ versions, and can be enjoyed with or without a printer. For kids ages 3 and up.

So call for your free Kid Pix sample disk. And discover why it's the perfect kid's paint program—bugs and all.

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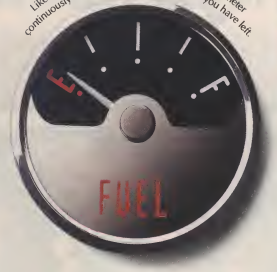
Like a gas gauge for your computer, the Stackometer continuously monitors the amount of space you have left.



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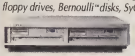
In addition to your available space, the Stackometer™ also shows you your compression ratios and fragmentation levels for all of your drives.



You can double your disk capacity on the full range of hard drives, all the way up to 2 gigs. As well as on floppy drives, Bernoulli™ disks, SyQuest™ cartridges, optical and floptical drives, and memory cards.

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In explaining what our new software does we ran out of space.

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they will show up now. Press backspace until the cursor reaches the end of the last line of text. Then press Alt, F, X to exit the editor and Enter to save the file. The saved file contains no blank lines.

The PATH Less Traveled

Is there a way to enter a PATH command that is more than 127 characters long? I'd like to be able to add more directory names to my PATH statement in AUTOEXEC.BAT, but DOS ignores everything past the 127th character. What can I do?

CHUCK KENNEY
ALBANY, NEW YORK

The classic way to circumvent DOS's limitation on the length of PATH statements is to use the SUBST command, as explained in this month's DOS column (see page 230). However, there is more than one way to skin a cat. Type the following DEBUG script into a text editor to create ADDTOIT.COM, a short utility that lets you append additional directory names to the end of a PATH string. Save the file as ADDTOIT.SCR.

```
N ADDTOIT.COM
E 0100 EB 65 53 79 6E 74 61 78
E 0108 3A 20 41 44 44 54 4F 49
E 0110 54 20 70 61 74 68 73 74
E 0118 72 69 6E 67 0D 0A 24 49
E 0120 6E 73 75 66 66 69 63 69
E 0128 65 6E 74 20 65 6E 76 69
E 0130 72 6F 6E 6D 65 6E 74 20
E 0138 73 70 61 63 65 0D 0A 24
E 0140 50 41 54 48 20 76 61 72
E 0148 69 61 62 6C 65 20 6E 6F
E 0150 74 20 66 6F 75 6E 64 0D
E 0158 0A 24 00 00 00 00 50 41
E 0160 54 48 3D 00 00 00 00 FC
E 0168 BE 81 00 AC 3C 20 74 FB
E 0170 3C 0D 75 0C BA 02 01 B4
E 0178 09 CD 21 B8 01 4C CD 21
E 0180 4E 89 36 5A 01 33 C9 AC
E 0188 3C 0D 74 03 41 EB F8 89
E 0190 0E 5C 01 E8 7A 00 E8 8D
E 0198 00 BB D8 E8 98 00 89 3E
E 01A0 65 01 2B DF BA 1F 01 83
E 01A8 EB 02 3B 1E 5C 01 7C C7
E 01B0 BE 5E 01 33 FF B9 05 00
E 01B8 E8 8C 00 BA 40 01 72 B7
E 01C0 32 C0 B9 FF FF F2 AE 4F
E 01C8 89 3E 63 01 26 80 7D FF
E 01D0 3B 74 0F FF 06 5C 01 FF
E 01D8 0E 5A 01 8B 36 5A 01 C6
E 01E0 04 3B 88 36 65 01 8B FE
E 01E8 03 3E 5C 01 8B CE 2B 0E
E 01F0 63 01 41 FE 8C C0 8E
E 01F8 D8 F3 A4 1F BB 36 5A 01
E 0200 BB 3E 63 01 8B 0E 5C 01
E 0208 FC F3 A4 B8 00 4C CD 21
E 0210 8C C0 26 3B 06 16 00 74
E 0218 07 26 8E 06 16 00 EB F0
E 0220 26 8E 06 2C 00 C3 06 8C
E 0228 C0 48 8E C0 26 A1 03 00
E 0230 B1 04 D3 E0 07 C3 FC 32
E 0238 C0 33 FF B9 FF FF F2 AE
E 0240 26 80 3D 00 75 F8 C3 FC
E 0248 26 83 3D 00 74 0F 51 56
E 0250 57 F3 A6 5F 5E 59 74 03
E 0258 47 EB ED F8 C3 F9 C3
RCX
015F
W
Q
```

Make sure that the directory containing DEBUG (usually your DOS directory) is in the DOS search path. Then

Challenge

I'VE SEEN TECHNIQUES FOR DELETING FILES RECURSIVELY FROM A DIRECTORY DOWN TO ITS MOST REMOTE SUBDIRECTORY. WHILE I CAN CERTAINLY USE THOSE PROGRAMS, I WONDER IF IT'S POSSIBLE TO DO THAT SAME KIND OF TASK WITH BATCH FILES.

CINDY CAPELLO
BOZEMAN, MONTANA

Typically, batch files offer limited flexibility compared with traditional programming languages like BASIC and C. On the other hand, batch files are easier to understand and use—and we've seen ingenious things done with the simplest of tools.

The Challenge is this: Using only batch file commands, create a batch file that will perform common file-manipulation tasks (copy, delete, directory listing, and so on) on both the current subdirectory and any subdirectories beneath. Of course, if you start from the root directory, you'll need to recurse through all subdirectories beneath the root, all subdirectories on the next level below that, and so on. The problem is a bit tougher than you might think, but that has never stopped readers from taking on the Challenge.

Do you feel up to it? If so, drop us a letter marked January Challenge. If we publish your solution, we'll convey our thanks by sending you a *PC/Computing* "I Solved the Challenge" T-shirt. Be sure to include your shirt size: S, M, L, or XL.

SEPTEMBER CHALLENGE SOLVED

In September, we challenged you to help a reader discover a way to calculate a median value for a range of numbers in Lotus 1-2-3. The median value in a range is the number that falls in the middle—half the numbers have higher values and half have lower values than the median. For example, in the group of numbers 1, 2, 3, 5, 5, the median value is 3—the mean is 3.2.

The winner of the September Challenge was Shane Devenshire of Walnut Creek, California. Shane's winning entry is a simple formula that you can use to calculate the median value in a range. First, enter the values for which you want to calculate a median. Then, sort the values in ascending order using the /Data, Sort menu sequence. Finally, name the range with a mnemonic title such as MED_RNG for more readability later (though the formula doesn't require that you name the range). Finally, enter this formula into a single cell (all in one line) where you want the answer to appear:

```
(@INDEX(R,0,@COUNT(R)/2)+
  @INDEX(R,0,@COUNT(R)/2-
  (@MOD(@COUNT(R),2)=0)))/2
```

Interestingly, even the latest version of Lotus 1-2-3, Release 2.4, doesn't include a function for calculating the median value. With Excel 4.0, in contrast, entering the simple formula =MEDIAN(RANGE) is all you need to do. The column of numbers doesn't even have to be sorted! Our thanks go to Shane Devenshire.

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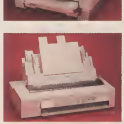
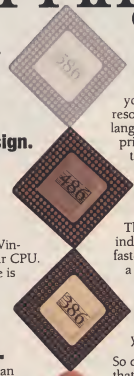
WinPrinter™ 600XL



WinPrinter 360XLS

WinJet™ 1200 Upgrade



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WinJet 800**	800 dpi	8½" x 14"	50 TrueType	$795
WinJet 300Si***	300 dpi	8½" x 14"	50 TrueType	$995
WinJet 300**	300 dpi	8½" x 14"	50 TrueType	$495
Windows Printers	**Resolution**	**Maximum Paper Size**	**Fonts Included**	**Price**
WinPrinter 800	800 dpi	8½" x 14"	50 TrueType	$1,595
WinPrinter 600XL	600 dpi	11" x 17" [A3]	50 TrueType	$3,695
WinPrinter 360XLS	360 dpi	17" x 22" [A2]	50 TrueType	$1,795

*Upgrades an HP LaserJet 4 **Upgrades an HP LaserJet II, IID, III, and IIID. ***Upgrades an HP LaserJet IIISi.

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make DEBUG compile the program with the following command:

```
DEBUG < ADDTOIT.SCR
```

Alternatively, download ADDTOIT-.COM from PC/Contact, *PC/Computing's* CompuServe forum. Type GO PCCONTACT at any CIS prompt. When you enter the forum, look for the file ADDIT.ZIP in data library 1 (Hot Tips/Secrets). If you don't yet have a CompuServe account but would like to download this and other *PC/Computing* programs, see page 276 for more information.

ADDTOIT lets you break a long PATH command into several commands. For example, to render a path of C:\DOS;C:\WINDOWS;C:\MASM\BIN, use

```
PATH=C:\DOS;C:\WINDOWS
ADDTOIT C:\MASM\BIN
```

or even

```
PATH=C:\DOS
ADDTOIT C:\WINDOWS
ADDTOIT C:\MASM\BIN
```

By breaking a long PATH statement into smaller components that fit within DOS's 127-character limit on individual commands, you can create PATH strings that are limited only by the amount of free environment space. If ADDTOIT displays the "Insufficient environment space" error message, increase the environment size with a SHELL statement in CONFIG.SYS. Turn to this month's DOS column, page 230, to see how.

Another error message you might see from ADDTOIT is "PATH variable not found." This means that the environment currently contains no PATH string. (ADDTOIT can't create a PATH statement; it can only add directory names to an existing one). One annoying drawback to DOS's SET and PATH commands is that they will display only the first 127 characters of the PATH, even though DOS uses the full ADDTOIT path when it searches your hard disk for an executable file.

One caveat: Use ADDTOIT in moderation. Long PATH strings slow DOS down, and the later a directory name appears in a PATH string, the longer it takes DOS to find a program file in that directory. Keep your PATH statements as short as possible.

Can I Copy These Utilities?

A recent letter in your Q&A column regarding software licensing raised a new question in my mind. Is it legal for me to use utilities and programs printed in your magazine? I see no software license or statement that these programs are in the public domain. Some of my co-workers say that a recent Supreme Court ruling suggests that these programs belong to the author and that we need written permission from the author to use these programs legally. What is the legality of using programs that are printed in your magazine?

BRIAN PIER
SPRINGFIELD, ILLINOIS

Here's the bottom line on the use of the utilities we make available. These programs are copyrighted, but they can be copied. You may make copies for others as long as no charge is involved; however, making copies for any commercial purpose is prohibited.

Mysterious Dots

Somehow the DOS subdirectory entries "." and ".." have appeared in the root directory of my C: drive and are causing errors during backup of this drive. Is there any way to eliminate those two symbols without reformatting the hard drive or deleting all of the files in the root directory?

DONALD STEWART
UPLAND, CALIFORNIA

Normally, the dot and double-dot symbols, which represent the current directory and the parent of the current directory, respectively, appear only in subdirectories. The root directory, after all, has no parent directory. That they've shown up in your root directory can mean only one thing: The system area of your hard disk (where DOS stores information about files and subdirectories and where they are physically located on the disk) is scrambled.

Reformatting the drive is one way to take care of the problem. Before you resort to reformatting, however, run CHKDSK on the drive. It will probably report numerous errors, possibly including lost allocation units and cross-linked files. Run CHKDSK with a /F (for Fix) parameter, and it will attempt to restore order to your disk. You'll lose the files that were affected when the disk was scrambled, but there is a good chance that the majority of the files will remain intact.

DOS's use of the dot and double-dot entries has some practical, timesaving applications for the DOS jockey. You can substitute the double dot for the name of a parent directory in any DOS command that accepts a directory name. For example, if you're in the \WP51\DOC directory and want to go to \WP51, you could save keystrokes by replacing the subdirectory name with dots, like so:

```
CD ..
```

You may also enter the double dot as part of a longer pathname. For example, if you are currently in the \WP51\DOC directory and you want to change to \WP51\MEMOS, type

```
CD ..\MEMOS
```

Under the right circumstances, the single-dot entry can be useful, too. For example, if you have a batch file named DIR.BAT and you try to run it by typing DIR, DOS executes the internal DIR command rather than the batch file. However, if you go to the directory where DIR.BAT is located and type .\DIR, DOS runs the batch file instead.

This is a great way to disguise programs and batch files so that only you can run them. If someone else is using your PC and that person doesn't know this little trick, he or she will have a difficult time figuring out how to run your program.

Do you need help using your computer? Q&A provides practical advice on PC problems. Questions are selected on the basis of broadest interest and may be edited for clarity and length. Sorry, but we cannot answer questions individually. Send your question, along with any screen printouts or other details that could help solve it, to Q&A, Help, *PC/Computing*, 950 Tower Lane, 20th Floor, Foster City, CA 94404. You can also reach us via CompuServe, on *PC/Computing's* PC/Contact online service. Send your comments or questions to 76000,21.

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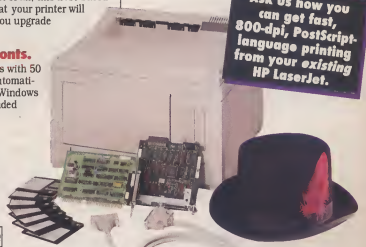

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Keep It Secret! A File-Encryption Starter Kit

PASSWORD-PROTECT YOUR PERSONAL FILES SO THAT ONLY YOU CAN SEE THEM.

BY MATTHEW LAKE AND JEFF PROSISE

EVERYONE HAS SECRETS. Whether it's your CompuServe ID and password, a confidential report, or a Christmas list, there's always something on your hard drive or floppy disks that's for your eyes only. Here are several ways to keep secrets on your PC by scrambling sensitive files so that only you can use them.

The password-protection routines here are all based on a small file-encryption program called ENCRYPT.COM that you create with DEBUG. Four batch files—SCRAMBLE.BAT, SEE.BAT, GET-.BAT, and SECRET.BAT—enhance the program. SCRAMBLE encrypts files with a password you provide, SEE shows text hidden in encrypted files (when you provide the right password), GET extracts files from encryption, and SECRET enables you to write confidential information in a text file and encrypt it in one step.

To get these files onto your hard disk, copy each of the listings in this article into a text editor, and save them as text files with the names indicated. Or, download NCRYPT.ZIP, a compressed file of all four batch files, from PC/Contact's data library 1 (Hot Tips/Secrets). Save them in a directory mentioned in AUTOEXEC.BAT's PATH statement, such as your batch or utilities directory, so that you can run them from any prompt.

/// ENCRYPT.SCR ///

```
N ENCRYPT.COM
E 0100 EB 34 53 79 6E 74 61 78
E 0108 3A 20 45 4E 43 52 59 50
E 0110 54 20 22 70 61 73 73 77
E 0118 6F 72 64 22 20 3C 69 6E
E 0120 66 69 6C 65 20 3E 6F 75
E 0128 74 66 69 6C 65 0D 0A 24
E 0130 00 00 00 00 00 00 00 FC BE
E 0138 81 00 AC 3C 20 74 FB 3C
E 0140 0D 74 61 3C 22 75 5D B8
E 0148 EE 33 C9 AC 3C 22 74 07
E 0150 3C 0D 74 50 41 EB F4 0B
E 0158 C9 74 49 B9 0E 34 01 B8
E 0160 00 80 33 D2 F7 36 34 01
E 0168 F7 26 34 01 A3 30 01 B4
E 0170 3F B8 00 00 BB 0E 30 01
E 0178 BA C4 01 CD 21 72 20 0B
E 0180 C0 74 1C A3 32 01 EB 24
E 0188 00 B4 40 BB 01 00 B8 0E
E 0190 32 01 BA C4 01 CD 21 72
E 0198 06 3B 06 30 01 73 D0 B8
E 01A0 00 4C CD 21 B4 09 BA 02
E 01A8 01 CD 21 EB F2 88 F5 BF
E 01B0 C4 01 88 0E 32 01 AC 3C
E 01B8 22 75 03 88 F5 AC 30 05
E 01C0 47 E2 F3 C3
RCX
C4
W
Q
```

Tales from Encrypt

Once you have the text file ENCRYPT-.SCR on your hard disk, switch to the directory it's in and type the following command to create the program ENCRYPT.COM. (*Note:* Ensure that there is a carriage return following the final *Q* in ENCRYPT.SCR, or your computer will hang when you enter this command.)

```
DEBUG < ENCRYPT.SCR
```

Type DIR *.COM to verify that ENCRYPT.COM has been generated. Enter ENCRYPT at the DOS prompt to see ENCRYPT's command-line syntax. Use redirection characters—the greater-than (>) and less-than (<) symbols—to specify your password, the file to be encrypted, and a filename for the new, encrypted file. Then test the utility by encrypting a text file in the current directory—ENCRYPT.SCR is a good choice—with the following command:

```
ENCRYPT "PASSWORD" < ENCRYPT.SCR
  > TEST.ENC
```

Use DOS's TYPE command to view the contents of both ENCRYPT.SCR and TEST.ENC and be assured that no word processor or any other program can make sense of the encrypted file.

ENCRYPT works by using a logical operation called an exclusive OR (XOR) that sets a destination bit to 1 or 0 depending on the values of two source bits. Each byte in the password is combined in an XOR relationship with each byte in the file, and the resulting byte is put into the encrypted file. After a file undergoes the XOR encryption process, its contents are no longer recognizable.

The remarkable thing about the XOR algorithm is that running a file through ENCRYPT a second time with the same password decrypts the file, so you don't need a separate utility. To restore the file, enter a line with a syntax similar to the original:

```
ENCRYPT "PASSWORD" < TEST.ENC
  > RESULT.SCR
```

To check that the file is restored, type COMP ENCRYPT.SCR RESULT.SCR, and DOS should respond with "Files compare OK."

If you need additional security, encrypt the file twice. After encrypting a file the first time, use ENCRYPT on the encrypted file, with a new password (since using the same password would just decrypt the file). The resulting doubly encrypted file will resist the most determined efforts to decode it. To decrypt a doubly encrypted file, simply reverse the process. Run it through ENCRYPT with one of the passwords, then run the resulting file through ENCRYPT with the other password. Because of the way the XOR encryption works, it doesn't matter which password you use first, as long as the passwords are the same two you used to encrypt the file.

Want Those Files Scrambled?

Although ENCRYPT.COM works fine by itself, its complicated command-line syntax and rudimentary help instructions leave a little to be desired. To make things easier (and to guard against typing mistakes), use SCRAMBLE.BAT, SEE.BAT, and GET.BAT.

Enter SCRAMBLE at a DOS prompt for instructions from SCRAMBLE.BAT. To encrypt an existing file of any sort—text, formatted text or number, or binary (graphics or programs)—use the following syntax:

```
SCRAMBLE source.doc
      password target.doc
```

If you miss any of the three required parameters, the batch file's IF (%3)==()

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BYTE Magazine's Reader's Choice Awards 1992

INFO WORLD PRODUCT OF THE YEAR 1992

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GOTO INFO line jumps to a help paragraph. You can customize any line in this paragraph (just remember to precede any line you want to see onscreen with an ECHO command).

The batch file offers to delete the original file as a security measure. If you want to delete the original, press Enter. For a little protection against DOS's UNDELETE command, the batch file overwrites the original file with a single word so that once you've deleted the file, it's extremely difficult to restore the information. This poses a risk to your data (if you forget the password, you'll never get your file back), but it also provides a fair amount of security.

If you don't want to delete the original, simply press Ctrl-C or Ctrl-Break when the batch file prompts you, and answer Y to DOS's question "Terminate Batch operation?" If you don't like this option, just delete the lines between ECHO. and :INFO or precede each of them with REM to make them remarks instead of instructions.

If you want to scan an encrypted text file without first decrypting it, use SEE.BAT. This batch file requires only two parameters: the encrypted file's name and the password. The batch file redirects the decrypted information to the DOS command MORE, which displays it onscreen one page at a time.

When you're finished reading the file, SEE clears the screen so that nobody else can see your files. If you don't want to clear the screen, press Ctrl-C or Ctrl-Break to stop the batch file.

To extract a file from its encrypted form and leave it on disk, use GET. This batch file requires three parameters: the encrypted source file, its password, and the target file. The DIR %3 command at the end of the batch file verifies that the file has been decrypted—if you get a FILE NOT FOUND statement, it's because there was a problem creating it. Make sure that you entered the encrypted file's name correctly and that it's in the current directory or one in your PATH. Then try running GET again.

SCRAMBLE.BAT

```
@ECHO OFF
IF (%3)==() GOTO INFO
ENCRYPT "%2" < %1 > %3
ECHO.
ECHO SCRAMBLE will remove every trace of the file you just hid,
ECHO except for password-protected information in an encrypted file,
ECHO unless you enter Ctrl-C or Ctrl-Break now.
ECHO Press any other key to delete the original file.
ECHO.
PAUSE > NUL
ECHO SECRET > %1
DEL %1
GOTO END
:INFO
ECHO.
ECHO SCRAMBLE uses ENCRYPT.COM to encrypt a file you want to keep secret.
ECHO Use this syntax:
ECHO SCRAMBLE file password encrypted_filename
ECHO.
:END
```

SEE.BAT

```
@ECHO OFF
IF (%2)==() GOTO INFO
ENCRYPT "%2" < %1 | MORE
GOTO OUT
:INFO
ECHO.
ECHO SEE uses ENCRYPT to display information hidden in encrypted files.
ECHO Use this syntax:
ECHO SEE file password
ECHO.
GOTO END
:OUT
ECHO.
ECHO Press any key to clear the screen, or press
ECHO Ctrl-C to quit the batch file and keep the info displayed.
PAUSE > NUL
CLS
:END
```

Keep a Secret

A short text file containing such private information as your credit card numbers, online service ID numbers and passwords, and appointments can be crucial for the mobile computing expert. To make a quick and confidential list, use SECRET.BAT, which sends the text you enter to ENCRYPT.

SECRET.BAT requires two parameters: output filename and password. First, the batch file uses COPY CON to create a text file from characters you type. Enter data line by line, and DOS stuffs it into a temporary file, TEMP.TMP. When you've finished, press Ctrl-Z (or F6) followed by Enter. The batch file then calls ENCRYPT.COM and passes it the name of the temporary file and the two parameters you entered at the DOS prompt. Finally, SECRET.BAT overwrites the temporary file with a single word (to make it difficult to recover) and deletes it.

Because SECRET.BAT uses temporary files, it can promote disk fragmentation by writing and deleting files. To prevent this and to speed up performance a notch or two, edit the batch file to send the decrypted temporary file to a RAM disk, if you have one. To do this, simply insert the RAM disk's drive letter before each instance of TEMP.TMP in the batch file. If your RAM drive letter is G:, for example, the encryption line would read

```
ENCRYPT "%2" < G:\TEMP.TMP > %1
```

Putting the temporary file on a RAM disk also will eliminate the remote possi-

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Circle 118 on reader service card.

PC Contact

THIS MONTH'S FREE SOFTWARE All the public-domain and shareware programs, batch files, and utilities featured in *PC/Computing* each month are available on our online service, PC/Contact, or on disk from Public Brand Software for a fee. Here's a sampling of the programs you'll find this month.

Protect Your Secrets ..... Help, page 272

Everyone has secrets they want to protect. It might be a CompuServe password, a confidential report, or even Junior's Christmas list. We've compiled four programs that together help you encrypt files, and then decrypt or simply view them. These password-protection routines are based on a small file-encryption program called ENCRYPT.COM that you create with DEBUG. Look for NCRYPT.ZIP in data library 1 (Hot Tips/Secrets).

Enhance Your PATH string ..... Help, page 230

Feel constrained by DOS's arbitrary limit on the number of characters in your PATH statement? The classic way to circumvent that limit is to use the SUBST command, as demonstrated in this month's DOS column. But we've made an alternative available to you on PC/Contact. ADDTOIT.COM, a short utility, can append additional directory names to the end of a PATH or break a long PATH into several commands. Download ADDIT.ZIP from data library 1 (Hot Tips/Secrets).

New File Format for PC/Contact!

Starting with this issue, we'll be providing files in the popular ZIP file format. Files stored this way offer several advantages. First, many files are stored in together in an *archive* file so you don't have to download multiple files. Second, the files within an archive are compressed so that you can download the archive file faster, saving telephone and connect charges. You need a program that supports ZIP files, however, and we offer several. PKZ110.EXE is a shareware collection of command-driven utilities for managing files in the PKZIP format. If you favor a menu-driven format, check out the shareware PKZMEN.EXE. If you just want a free unZIPper, try PDZIP.EXE. All ZIP utilities are in data library 0 (General/Forum Info).

HOW TO JOIN PC/CONTACT

For current CompuServe subscribers, just type GO PCCONTACT to access the forum. Cost is based on CIS's fee of $12.80 per hour for 1,200/2,400 bps and $22.80 per hour for 9,600 bps. There is an additional $2.50 ZiffNet membership charge per month for all users, which includes a number of free services. For complete information, type GO ZNT:RATES when online.

For new subscribers, follow these steps:

1. Set the following parameters within your communications program: 7 data bits, even parity, 1 stop bit, and full duplex.
2. Call CompuServe's toll-free Customer Assistance Line at (800) 848-8990 (United States) or (800) 635-6225 (Canada). From other countries, dial CompuServe direct at (614) 457-8650. A voice-response system will ask you if you want a local-access number. Then you'll be asked to enter your phone number and the speed at which you want to access the system. CompuServe reads back the local number you'll use to access the service.
   Or, call CompuServe with your modem. Set up your modem and telecommunications package using 7 data bits, even parity, 1 stop bit, and full duplex, and call (800) 346-3247. When the modem connects, press Enter. When you see the HOST NAME prompt, type in PHONES and then hit Enter. Then just follow the onscreen menus and note the access phone number for your area.
3. Dial the local-access number with a modem. When you connect to the network, press Ctrl-C to get its attention.
4. At the HOST NAME prompt, type CIS (which is the acronym of the CompuServe Information Service).
5. At the USER ID prompt, enter 177000,5300.
6. At the PASSWORD prompt, enter PC/CONTACT.
7. At the ENTER AGREEMENT NUMBER prompt, type Z100PCC1.
8. If you have trouble, call the Customer Assistance Line at (800) 848-8990. After you follow the above procedures, the CIS system will provide you with your own user ID—called a PPN—and a temporary password. You can then log on and begin to explore PC/Contact. In about two weeks, you'll receive a letter from CIS confirming your PPN and providing you with a new password. You should then change your password by typing GO PASSWORD at any CIS prompt.

TOP PICKS ON DISK

You can easily get all the public-domain utilities or shareware covered in this month's issue by calling the disk vendor Public Brand Software at (800) 426-3475. Ask for this month's Editors' Picks from *PC/Computing*. They're available for $5 or less per disk (most disks have several utilities and programs on them), plus $5 for shipping and handling. Visa and MasterCharge are accepted.

Toolkit

GET.BAT

```
@ECHO OFF
IF (%3)==() GOTO INFO
ENCRYPT "%2" < %1 > %3
DIR %3
GOTO END
:INFO
ECHO.
ECHO GET retrieves files you've
ECHO encrypted with SCRAMBLE or
ECHO ENCRYPT.
ECHO Use this syntax:
ECHO GET file password
ECHO decrypted_filename
ECHO.
:END
```

SECRET.BAT

```
@ECHO OFF
IF (%2)==() GOTO INFO
ECHO Enter your secret below.
ECHO Press Enter at the end of
ECHO each line.
ECHO Use as many lines as
ECHO necessary.
ECHO When you're done, press
ECHO Ctrl-Z, Enter.
COPY CON TEMP.TMP > NUL
ENCRYPT "%2" < TEMP.TMP > %1
ECHO SECRET > TEMP.TMP
DEL TEMP.TMP > NUL
GOTO END
:INFO
ECHO.
ECHO SECRET.BAT lets you enter
ECHO text, and uses
ECHO ENCRYPT.COM to hide it in a
ECHO file of your choice.
ECHO Use this syntax for the
ECHO command:
ECHO SECRET filename password
ECHO.
:END
```

bility that a snoop with a disk editor will find the remnants of the decrypted temporary file on your disk. Because the decrypted text in the RAM disk is never written to your hard disk, it disappears forever as soon as you turn off your computer.

One final word of warning to those tempted to be inventive with their passwords: Don't get carried away. There's no key that will let you decrypt a file whose password you have forgotten. For safety's sake, use the same password for every file—you'll be less likely to suffer a memory lapse. ◪

Now, other word processors have something they never had before.

Features	Ami Pro 3.0	Word for Windows 2.00	WordPerfect® for Windows 5.1
True WYSIWYG in all views eliminates guesswork	Yes	No	No
Fast Format – quick repetition of text formats	Yes	No	No
SmartMerge step-by-step mail merge guide with a card file data manager	Yes	No	No
Preview of professionally-designed Style Sheets for memos, faxes, letters, newsletters, etc.	Yes	No	No
WYSIWYG preview in File Open to quickly view, print, or extract text	Yes	No	No
Number of import/export filters (word processing, database, spreadsheet, graphics)	45	27	36
Grammar Checker	Yes	Yes	No
On-line Tutorial	Yes	Yes	No
Automatic re-numbering of lists	Yes	No	No
Colorful, customizable, editable, sizable SmartIcons™ for one click access to your most frequently used tasks	Yes	No	No
In-context editing of drawings and charts	Yes	No	No
Laptop Install option for quick and minimal configuration on a laptop	Yes	No	No
Clean Screen option for total workspace customization	Yes	Yes	No

Competition.

Take a look at this chart and you'll see, feature-by-feature, just how far Ami Pro® 3.0 has leaped ahead of other Windows™ word processors. Which, not surprisingly, is why it's being hailed as the best word processor for Windows by respected and objective evaluators.

Ami Pro 3.0 takes top honors.

In fact, in recent tests† conducted by the National Software Testing Laboratories, Software Digest® (Vol. 9, No. 6, Sept. '92) gave Ami Pro 3.0 the highest Overall Evaluation in its category.

Their reason: "Lotus Ami Pro 3.0 offers an unbeatable combination of peerless usability, top-level features and fastest overall performance."

It also received the highest score ever for a Windows word processor in a recent InfoWorld® review. So it's definitely the word processor to evaluate.

Now that you've seen the evidence, why not prove it to yourself? Call us at **1-800-872-3387, ext. 7271** for your free working model or to upgrade from your current word processor for just $129.*

Ami Pro 3.0. It's the one word processor for Windows that doesn't just invite comparison. It welcomes it.

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Lotus Ami Pro 3.0 Word Processor for Windows

†Among Windows word processors tested. *Call for a list of eligible word processors. Education-priced Lotus products not included. Offer valid in U.S.A. only. Not to be combined with any other offer. Please have your credit card and current word processor ready when you call. In Canada, call **1-800-GO-LOTUS**. © 1992 Lotus Development Corporation, 55 Cambridge Parkway, Cambridge, MA 02142. All rights reserved. Lotus and Ami Pro are registered trademarks of Lotus Development Corporation. Software Digest is a registered trademark of NSTL, Inc. Reprints of report available upon request. InfoWorld is a registered trademark of InfoWorld Publishing, Inc. WordPerfect is a registered trademark of WordPerfect Corporation. Adobe Type Manager and the ATM logo are trademarks, in the United States, of Adobe Systems, Inc.

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PC MAGAZINE EDITORS' CHOICE

August 1992
Toshiba T4400SXC

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Save Money on Your PC's Ravenous Electric Bill

WHAT'S GOOD FOR YOUR WALLET IS RIGHT FOR THE PLANET, TOO. **BY STEVE ROSENTHAL**

YOUR NEXT DESKTOP COMPUTER MAY USE A lot less electrical power, especially while it's waiting for your attention, which will be good news for both your electric bill and the environment. But even with current equipment, changing the way you work can make a difference now.

In an effort to encourage reductions in nonproductive uses of electricity, the U.S. Environmental Protection Agency (EPA) has created the Energy Star program, challenging computer manufacturers to apply some of the power-saving technologies they've learned from building battery-operated computers to desktop machines. More than a dozen computer companies are working to meet the EPA's Energy Star program's goal.

Companies that produce desktop computers with a power-saving idle mode that meets the program's 35-watt maximum will be able to promote those machines with a green Energy Star logo. Eventually, the program may include terminals, printers, and other power-hungry peripherals.

Conspicuous power consumption is a far from trivial problem. According to Researcher Jeff Harris of Lawrence Berkeley Laboratories, an electrical utility industry study found power used by office equipment jumped from about 25 billion kilowatt hours (kwh) to 125 billion kwh in one decade—an increase equivalent to the output of 20 full-size power plants. In newer buildings, the energy used for desktop computers and office machines often exceeds that needed for lighting.

This energy demand is compounded by the extra air conditioning needed to offset the heat produced by increased electrical consumption. Marc Ledbetter, deputy director for the American Council for an Energy Efficient Economy in Washington, D.C., calculates that "for each watt of power represented by office equipment, you must add 1.4 watts of cooling load."

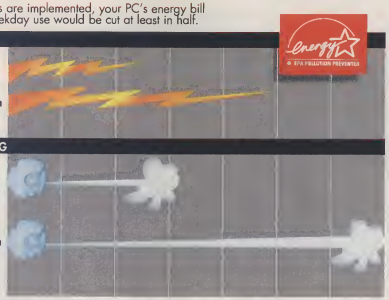
Furthermore, most of this consumption occurs during peak demand, when air conditioning and wiring are already strained in many office buildings. The increased demand can cost extra money for rewiring or added air conditioning.

Even for the single user who is exempt from air conditioning or peak demand problems, energy consumption can add up. "A typical IBM PC–class computer and monitor left on all the time use about as much energy as a home refrigerator," says Les Norford, assistant professor of Building Technology at the Massachusetts Institute of Techonology. With marginal utility rates edging past 15 cents per kwh in some parts of the country, the effective cost for the power alone could top $150 per year. Improved design might be able to cut that amount by as much as 90 percent.

But the most important savings of all could be conservation of our natu-

Energy Star Would Cut Annual Utility Costs

If recommendations are implemented, your PC's energy bill on average for weekday use would be cut at least in half.



*Calculations based on EPA/MIT figures. Values assume 35 million PCs in use. Air conditioning is measured in equivalent hours for standard 1,750-watt single-room model. Multiply savings by four if PC had previously been left on all the time.

ral resources, points out EPA Energy Star Program Manager Brian Johnson. Throughout the country, some or all electrical power comes from the burning of fossil fuel, which releases carbon dioxide and contributes to the "greenhouse effect." That's why, according to Johnson, the Global Change Division of the Office of Air and Radiation is researching voluntary efforts that could significantly cut energy waste.

Several engineers at computer companies that have signed on to the EPA plan believe that the basic technology required to achieve these power-reduction goals is already available, and that it very possibly could be implemented at little or no cost to the consumer. "Fortunately, it can be done," says Walt Rosenberg, corporate environmental manager for Compaq, "but it's a question of exactly how to do it." Compaq, Rosenberg says, is looking at whether desktop users will accept a longer hard disk spin-up time (as on a portable) and what special problems might result from slowing down the CPU when users are running groupware and networking applications in the background.

Similarly, Hewlett-Packard engineers are looking at the tradeoffs in reducing power consumption in laser printers, and several monitor makers are experimenting with power-down modes for CRT displays. Besides Compaq and HP, other companies that were among the first to announce their intentions to build Energy Star–compliant units were Apple Computer, Digital Equipment Corporation, IBM, NCR, and Zenith Data Systems. However, don't expect any Energy Star PCs until later in the year.

Meanwhile, you don't have to wait for the new designs to save energy, says MIT's Norford. One place to start, he says, is with peripherals. Choose those that require low standby energy, such as ink jet rather than laser printers for low-volume applications. And use flat-panel displays instead of CRTs.

LEFT ON ALL THE TIME, THE TYPICAL PC AND MONITOR CONSUME AS MUCH ENERGY AS A HOME REFRIGERATOR.

Also, you may want to rethink your use of so-called screen-saver utilities. They may be fun to watch, but they can ultimately cost you many times their purchase price in wasted electricity. The fact is that screen savers do not reduce the power consumption of the CRT, which represents the biggest drain on the computer's power supply. If you really want to save money, turn off the monitor when it's not in use.

Switching off an idle computer is an obvious though sometimes controversial thing to do. According to Norford, no conclusive studies about PC longevity have been published, so it's possible each power-down cycle could cause a slight diminution in average unit life. But in practice any such decrease is likely to be outweighed by the savings in the number of power-on hours. "The most severe prognosis we've had is that for every 3 to 3.3 times the CRT is turned off, the monitor's total life span drops by an hour," says Norford. Yet, he adds, other experts have observed no difference, and other PC components probably have better records.

If you're not going to use your system for 20 minutes or more, Norford concludes, you can extend its useful life by turning it off. And if the EPA is right, you'll not only save money—you'll also help extend life on the planet. ◩

PC/C Advocate

QUICK RESULTS, EXPERT ADVICE

LIBREX SUPPORT QUESTIONED

My worst nightmare was realized when Nippon Steel, parent company of Librex Computer Systems, announced that it was shutting down Librex. I recently bought one of Librex's 386SX-based notebooks. Most of the third-party suppliers I called did not have any parts for it. If the computer needs repair, will I be out of luck?

NOBUYA NEMOTO
NEW YORK, NEW YORK

Dan Stringari, technical support manager at Librex in San Jose, California, says Librex has contracted with GE Computer Services of Norcross, Georgia, to honor customer warranties. Librex computers carry one-year warranties on parts and labor. GE, he says, has a dispatch center in every major U.S. city. "There are plenty of parts in stock," he says. In the meantime, Librex's technical-support number, (800) 441-9510, will continue to operate through the first quarter of 1993. Customers who purchased Librex computers through the CompUSA retail chain or Damark mail-order house can also call the toll-free number for advice on how to get a machine serviced.

DOS ACT USER CRIES FOUL

I don't own Windows and would prefer not to move all my applications to Windows. It seems, though, that some software manufacturers are upgrading their Windows versions while neglecting their DOS users. I've been using Contact Software International's Act for about a year and have written the company twice to suggest improvements. I called customer support to find out when the features in the new Windows product would be incorporated into the DOS version and was told there was no anticipated date for the next edition of Act for DOS. I don't like the idea of supporting Windows users at my expense.

MAURY SWOVELAND
MISSION VIEJO, CALIFORNIA

Heidi Munin, who is in the marketing communications department of Contact Software, says that the Carrollton, Texas, firm is in the process of upgrading the DOS version of Act. Release 2.11 of Act for DOS came out just before the Windows version. "DOS is still our biggest market," she says.

Street Prices

Fast PostScript Printers

A fast laser printer shared on a network by many PCs is a cost-effective alternative to a single printer attached to one computer. These models are rated at 15 to 17 pages per minute as indicated in parentheses.

All of these PostScript printers produce a resolution of at least 300 dots per inch. For comparison, each includes 4MB of memory, except for the QMS, which comes standard with 8MB.

These prices reflect the general range for retail sales throughout the continental United States as provided to *PC/Computing* by *HardFacts on Disk*, the desktop reference of computer hardware for industry professionals. For further information, contact *HardFacts* at (508) 927-1370.

"We're addressing most of our users' concerns." You can expect to see the next DOS version in stores around March.

15 INCHES IS REALLY 13.5

I bought NEC's 15-inch 4FG monitor to replace my old, generic VGA monitor, which measured 13 inches diagonally. When I opened the box and checked the display, it turned out to be 13.5 inches. I called NEC and was told that the 15-inch figure is based on the distance between the screws that hold the CRT. It seems they put the screws in as for oport os possible so that they con advertise the screen os being larger thon it reolly is.

STEVE GUPTA
LA CANADA, CALIFORNIA

While TV manufacturers' claims can be verified by measuring the screen diagonally, monitor manufacturers measure the diagonal of the CRT before it goes into the case. According to Jeff Fors, associate product specialist for NEC Technologies in Wood Dale, Illinois, the distance between screws is irrelevant, despite what you were told. He says that NEC also includes the visual diagonal measurement on its monitor specification sheets. However, even this figure may be misleading because depending on the graphics card and display mode, a black border often lines the edges of the visual screen. What is really useful is a measurement of the active screen. Unfortunately, monitor makers promote their models in a way that makes the picture seem larger than it really is. There is no industrywide agreement on where, precisely, the ruler should be placed. This may change, though. The Video Electronics Standards Association, a trade group, wants standardized monitor descriptions. A spokesperson says, "The consumer really wants one number. It's an issue that needs to be addressed." Meanwhile, you may want to arm yourself with a measuring tape when shopping for a monitor.

OZONE FILTERS FOR COPIERS, TOO?

Your September 1992 Consumer's Edge section (page 350) included on article about ozone-proofing certoin older loser printers. I'm on office equipment dealer who sells computers, copiers, and fax machines. Though I wos aware of ozone filters on losers, I didn't know thot copiers also produced this gos. Recently, we have received o few customer complaints of headoches, nouseo, and odars being coused by one of our copier models. Are ozone filters ovoilable for copiers?

FRED MORGAN, JR.
MUNCIE, INDIANA

Yes, says Donna Elliott, director of sales at Filters America, a San Jose, California, distributor. Filters on copiers should be changed about every 50,000 pages, she says, but in dusty work areas the interval should be about 25,000 pages. Essentially, once the polyurethane-impregnated charcoal gets dusty, the filter doesn't work. Filters cost from $9.95 to $19.95.

PC/C Advocate QUICK RESULTS, EXPERT ADVICE

STACKER MANUAL REPLACEMENT

While I wos redesigning my computer room and installing new equipment, I discorded what I thought were some old monuols. I discovered I had inoodvertently troshed the documentation for my Stocker ond Avery LobelPro software. Since I hod returned the registration cords of both programs, I figured I could easily get replacements. Avery came through with o brond-new monuol ot no cost. Stoc Electronics, however, soid it would send me o new monuol—for $25. While I'm willing to poy the nominol shipping costs, thot figure seems unreosonable to me.

WALTER BOTT
VIENNA, VIRGINIA

Anne Galdos, Stacker product manager, says that Stac Electronics does hove a policy of charging $25 for an oddtional Stacker monuol, but special situations like yours are usually reviewed individually by customer service. Unfortunately, your request didn't make it that for ond wos not reviewed. She apologizes for your inconvenience and says thot under the circumstances, you will receive o free replacement monuol.

TIP OF THE MONTH

Because of their diminutive size and high value, notebook computers are increasingly attractive targets for thieves. Machines that are left unattended in offices sometimes disappear. Common sense dictates that you should lock your laptop in your desk during nonworking hours and even when other people are around but you're not. This is particularly important in locations that are accessible to the public.

Do you need help resolving a consumer issue? Drop a note to the PC/C Advocate, PC/Computing, 950 Tower Lane, 20th Floor, Foster City, CA 94404. Be sure to include a daytime phone number and any correspondence relating to your problem. Letters become the property of PC/Computing and will be edited for length and clarity. Sorry, but we cannot respond to letters individually.

You can also reach the PC/C Advocate via CompuServe on PC/Computing's PC/Contact online service. Send your messages to PC/C Advocate 76000,26.

Claude Monet. *Cliff Walk at Pourville, 1882.*

The image is priceless.

Fortunately, the printer isn't.

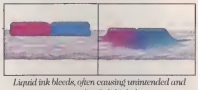
The clear superiority of solid ink technology is becoming legend.

Vibrant, precision color is finally here, and with JOLT it's also finally affordable.

Perhaps more surprising is that the image above is even better than this ad can show you, because this magazine uses a liquid ink which bleeds when it hits the paper. Solid ink holds its shape for noticeably better resolution.

Not only did Dataproducts pioneer the development of solid ink technology, our JOLT is also $3000 less than the only other color solid ink Adobe® PostScript® Level 2 printer on the market.

Even more impressive is JOLT's flexibility. Because of the non-dispersing



Liquid ink bleeds, often causing unintended and inaccurate color. Solid ink does not.

nature of solid ink, it can not only print on plain paper, but on virtually any paper surface, giving you immense latitude when creating documents, presentations, publications and color comps.

And because of its solid ink technology, JOLT prints more readable text, even at extremely small point sizes.

Finally, JOLT is also more economical since it doesn't require any kind of special paper.

Unlike liquid ink printers, JOLT creates crisp characters in solid, bold color. (Enlarged 250%)

Imagine. Now you can produce 16.7 million different hues with the precision and vibrancy of solid ink, all at a remarkably low price.

So see your Dataproducts dealer today for a demonstration or call 1-800-334-3174 for more information.

Then stop by and check out JOLT, because when it comes to color printing, seeing is believing.

Dataproducts®

The high performance printer people.™

Group Hitachi Koki

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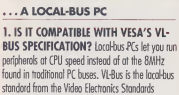
Circle 170 on reader service card.

What to Ask When Buying



. . . A LOCAL-BUS PC

1. IS IT COMPATIBLE WITH VESA'S VL-BUS SPECIFICATION? Local-bus PCs let you run peripherals at CPU speed instead of at the 8MHz found in traditional PC buses. VL-Bus is the local-bus standard from the Video Electronics Standards Association (VESA). Most of the new local-bus adapters coming out support VESA's VL-Bus connector standard and require a PC with one or more VL-Bus connectors.

2. HOW MANY LOCAL-BUS CONNECTORS DOES IT OFFER? Local-bus PCs typically offer one to three local-bus slots to attach peripherals. Go for one connector if you're primarily interested in speeding up graphics, two or three if you want to add other performance-boosting local-bus circuitry like disk controllers, multimedia adapters, or network adapters.

3. DOES THE LOCAL-BUS PC SUPPORT BUS MASTERING? Some computer makers claim VL-Bus compatibility, yet they don't support bus-mastering—a crucial part of the specification. Bus mastering is the ability of the connector to support "smart" adapters, cards that can do their own processing without draining CPU resources. Without specific support for bus-mastering, not all VL-Bus cards will work in the slot.

4. DOES THE LOCAL-BUS PC COME BUNDLED WITH LOCAL-BUS ADAPTERS? Many local-bus PCs come with local-bus graphics and/or hard disk controllers installed in the slots. Some don't. Check whether the PC you're evaluating does. If not, you may have to buy them separately.

5. WHERE CAN I BUY LOCAL-BUS ADAPTERS? If you didn't get local-bus adapters with your system or you're not happy with the ones you've got, shop around. Most leading graphics and mass-storage disk controller makers have announced or released local-bus versions of their products.

If It's Tuesday, It Must Be Level Four at the Megamall

BEST PC BARGAIN SURPRISES EVEN THE PHANTOM

BIG PRODUCTIONS ATTRACT THE PHANTOM, but that's an understatement when considering Mall of America, in Bloomington, Minnesota, the largest indoor shopping center in the United States. Lured by 4.2 million square feet of stores, restaurants, and even an enclosed amusement park, I was airborne.

It turns out that the parking lot has so many tiers that sections are designated by state. I parked in New York (or was it Florida?), entered the complex, and narrowly missed a double-stroller collision. Not knowing which way to turn, I grabbed a map and picked up an information phone to find out which stores carried computers. The operator suggested Service Merchandise and EBX. She failed to mention Sears or the two Radio Shacks, but both were listed on the kiosk directory.

She was mistaken about EBX. Except for a CD-ROM bundle and accessories like joysticks, EBX sold only software. (At least the directions were impeccable.) What caught my eye, though, was a Lotus 1-2-3 for Windows upgrade package for $99.99. I told the salesperson that since I had come to the mall to buy a computer, I hadn't brought any proof that I was entitled to the upgrade. "Could I buy it on impulse?" I asked.

"If you say you have it, I guess you can have it," she said, her eyes averting mine. It was tempting, but I was on a different quest.

I wondered if the two Radio Shacks might compete against each other. "There's no reason to," said a salesperson eager to sell me a Tandy 486SX/25 system. "We're at opposite ends of the mall." In fact, both stores did display the same newspaper ad that extended a "Radio Shack PC Sale" one more day. The model, offering 4MB of RAM, a 120MB hard disk, one floppy drive, a Super VGA card, DOS 5.0, Windows 3.1, and Microsoft Works for Windows, was priced at $1,388. But the monitor cost $399, bringing the total to $1,787. There was one difference between the two stores: Radio Shack No. 1 included shipping in the price; No. 2 charged extra.

I wandered into Sears Roebuck & Co. Across the aisle from major appliances beckoned an IBM PS/1 486SX/20 called The Consultant. The complete system included 4MB of memory, an 8K internal cache, a 170MB hard drive, 3½- and 5¼-inch floppy drives, a 2,400-bit-per-second modem, a 14-inch Super VGA (1,024 by 768 pixels) display, DOS 5.0, Windows 3.1, Works for Windows, Quicken for Windows, Prodigy, and The New Print Shop. (And if I had any reservations about going with the 486SX/20 processor, the CPU could later be upgraded to a 486DX.) The $1,899.99 price included preloaded software and a one-year, onsite warranty from IBM. Such a bundle for a full-fledged IBM at an IBM-clone price from a retailer not known for major discounting was unexpected. (By the way, OS/2 and MCA were nowhere in sight.)

I needed a reality check, so I went next door to Service Merchandise. The identical model and software bundle were available for $1,899.96—3 cents less. But there were some subtle differences (or so I thought). Unlike the clerk at Sears, the salesperson at Service Merchandise said that to keep prices low, the store expected customers to make their own floppy backups of all the software. This defeats the convenience of preloading, since I'd just be copying applications in the opposite direction. The cost of buying blank floppies and the time required to do the backup would be worth considerably more than 3 cents. Service Merchandise said having the system shipped to me in California via UPS would cost an additional $38.

THERE'S NOTHING LIGHTWEIGHT ABOUT THIS 3½ POUND NOTEBOOK.

At just over 3.5 lbs, the Dell® 320SLi offers features and functions usually reserved for systems twice its weight. So call and order one today. At this price, it shouldn't be a heavy decision.

You're not the only one working late. Dell's toll-free support lines are now open 6AM to midnight every day. There's also nationwide on-site service and a 24-hour TechFax™ line.△

Comes with everything you need to run even the most hardcore software: MS-DOS® 5.0, Microsoft® Windows™ 3.1, Lotus® Organizer and a keyboard mouse.

intel inside

That's not all you'll find in here. There's room for a modem, a coprocessor, 120 MB hard drive and up to 10 MB of RAM.

Your hands don't get smaller just because your computer does. So Dell gave the 320SLi a full 85-key keyboard, including special screen navigation keys in the familiar inverted-T layout.

We call it a notebook, but it's actually smaller. Just 7¼" x 11" and only 1¼" thick. So you might actually be able to fit some briefs in your briefcase. Maybe even a sandwich or two.

$2,149

LEASE ◇ : $80/MONTH

This small number gets you all these big numbers: 20 MHz i386™ SL processor, 2 MB of RAM, 60 MB hard drive, VGA Reflective (9.5", 640 x 480) LCD, external 3.5" floppy drive and up to 4 hours of work from the NiMH battery.

DELL

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PCComputing

COMING SOON

201 Windows Tips

Find out how to squeeze every last ounce of functionality out of your favorite Windows applications with minimal effort. We compile all the hottest tips, hints, macros, and shortcuts for the 40 most popular Windows applications. Whether you work with word processors, spreadsheets, databases, communications, graphics, utilities, development tools, or other business-computing software, you'll find the help you need to hone your skills.

LaserJet 4, the New Challenger

Laser printers are as much a business staple as the PC itself, and HP has always set the standard to which all other laser printer manufacturers respond. Now HP introduces a new family of LaserJets—faster and cheaper than the LaserJet III and sure to become the best laser printer value on the market. We take an in-depth look at the features and functionality of LaserJet 4 and check out some of its add-ons. Then we review ten LaserJet III clones that retail for less than $2,395 and share tips on what to ask when buying a LaserJet III–compatible printer.

Get Inside Your Computer

Since 1989, *PC/Computing* executive editor Ron White and technical illustrator Tim Downs have been explaining the fine points of your computer's inner workings in How It Works. This section of the Help department uses illustrations and straightforward descriptions to make highly technical information easily accessible to everyone. Recently, ZD Press developed this series into a book, *How Computers Work*. We excerpt a collection of highlights for you to preview.

Will the Real Bill Gates Please Stand Up?

You can hardly start a computer these days without using a Microsoft product. Bill Gates, with a fortune of around $7 billion, was just designated the richest person in America by *Forbes* magazine. How did Gates turn someone else's thorny operating system into a fortune that exceeds the GNP of a small country? Get the inside story in this first of two exclusive excerpts from Stephen Manes and Paul Andrews' new biography of Gates.

Our Life as a Wonk

We work hard. We slave in front of PCs all day every day. We want hardware. We want more powerful hardware. We want the most powerful hardware. Let's face it: We're wonks. True confessions from *PC/Computing*'s newest columnist will make you think that an insatiable appetite for computing power is socially acceptable.

Plus . . . new product info galore, batch file techniques, how to disaster-proof your PC, and how to choose and use a 16-bit sound card for less than $300.

Because Sears used a different carrier, shipping came to $14.95. Both stores said the PC could be returned within 30 days—in its original boxes—without a restocking fee.

I returned to Sears and pulled out my Discover card. If you want a system delivered locally, some Sears stores offer a $35 option that includes setting up the system on your desk. However, since The Consultant's ports are adequately labeled with icons and the software comes preloaded, there's little to be gained unless you have a bad back. (And incidentally, the 6.5 percent sales tax I paid was less than what I would have paid in California.)

With the work of computer shopping done, I was off to Camp Snoopy to ride the roller coaster and then to check out the other stores. Now, if I can just manage to get back on the plane with all these shopping bags.

Epilogue: The system arrived two weeks later—one week later than the salesperson had promised—and it contained a note claiming that he had been misinformed. Though manuals were included, the salesperson wrote, "The software that is preloaded is not backed up." So he had archived everything on the hard disk for me in ZIP files on 14 hand-labeled disks. (According to the literature in the box, customers are supposed to do this themselves and provide their own floppy disks.)

The salesperson's solution, though, was hardly ideal, since I had asked for the same program disks that you'd normally receive with DOS, Windows, and each preloaded application. Clearly, the salesperson at Service Merchandise was more knowledgeable, although that store's higher shipping charge would still have led me to Sears.

PHANTOM SHOPPER

I SPLURGED AND SPENT THE EXTRA 3 CENTS ON THE SEARS PC, BUT IT ARRIVED WITH AN APOLOGY FROM THE CLERK . . .

I had no problem returning the system to a Sears in California. In fact, I would have made money on the return if I hadn't pointed out to the clerk that Minnesota's sales tax is lower.

NEW! EXTENDED DOS VERSION ALSO AVAILABLE CALL (800) 621-1393

Real Stats. Real Easy.

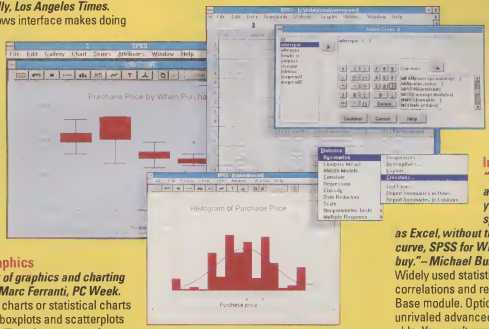
SPSS for Windows gives you answers your spreadsheet or database can't. It's a great value at $695!

Learn Fast, Work Fast

"Stumbling blocks to statistical analysis are eliminated with SPSS for Windows. You don't have to be a programmer to use it and you don't have to be a statistician to understand it." – Richard O'Reilly, Los Angeles Times.
The 100% Windows interface makes doing analysis simple. Context-sensitive help and an on-line glossary of statistical terms are just a click away.

Complete Data Management and Editing

"A breakthrough in data capacity and ease of use...impressive." – Alan Fridlund, InfoWorld. There's no limit on the number of variables you can analyze. Read data directly from Excel,™ Lotus,® .dbf and SAS® transport files. Work live with Oracle® and SQL Server™ data. Edit and use data many ways, easily.



Automatic Statistical Graphics

"A complete set of graphics and charting capabilities." – Marc Ferranti, PC Week.
Create business charts or statistical charts like histograms, boxplots and scatterplots automatically. Unlike other stats packages, edit the charts directly on-screen without respecifying.

In-depth Statistics

"For more statistical analysis tools than you'll get from a spreadsheet such as Excel, without the steep learning curve, SPSS for Windows is a great buy." – Michael Burgard, PC/Computing.
Widely used statistics such as crosstabs, correlations and regression are in the Base module. Optional modules with unrivaled advanced statistics are available. You won't grow out of this package.

When you really want answers you have to go beyond what spreadsheets or databases can offer. You need a package that is designed for real statistical analysis, reporting and charting – and is easy to use. You need SPSS® for Windows,™ the real stats, real easy combination that delivers real value.

You'll break out of the spreadsheet cell with SPSS for Windows. Do more than simple percentages and sums – subset, sample, aggregate, explore, summarize, poke and prod, slice and dice your data to get the answers you need. Analyze surveys, dig into databases, improve quality, conduct research studies, forecast sales and prepare reports with ease. All without writing complex macros or queries. Find relationships, see patterns and trends, determine significance and use the past to predict the future.

Learn fast, work fast. Prepare for your analysis quickly with SPSS' full-featured Data Editor. Choose from a broad range of statistical routines, including those in specialized add-on modules, that produce full-color charts automatically. Hot button between charts and related numerical output. Share information using DDE and OLE. Put together a great presentation with powerful and flexible business graphics and a report writer. If you need help, the documentation is full of statistical "how to," and experienced technical support is just a phone call away.

SPSS for Windows – when you need more stats than a spreadsheet or database can offer.

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Circle 130 on reader service card.

We figured it would take a Wizard to make your job easier.

The real magic of Microsoft® Excel is that all of its innovative tools have been designed to do just one thing: make your everyday work easier.

In order to achieve this goal, our product development team spends countless hours studying the way you work with your spreadsheet. Listening to your needs. And even following your suggestions.

For example, we discovered that with your current spreadsheet it's often difficult to make the kind of charts you want. So we designed a tool called the ChartWizard. It's so easy to use, it actually helps you create a number of smart-looking charts on-screen, step-by-step.

What about the things you have to do over and over again? The things that are time-consuming and tedious? Like filling in dates. Adding up numbers? And formatting worksheets?

Well, with Autofill, Autosum,™ and Autoformat, you can now do all these everyday tasks with just a few clicks of the mouse. Or as fast as you can say "one, two, three."

All of which has helped more than a million people who use Lotus® 1-2-3® make the switch to Microsoft Excel: the spreadsheet for Windows.™

And finally, we've not only made Microsoft Excel for Windows easier to use, we've also made it easier to get. Right now, you can easily switch for as little as $129.[1] Just visit your nearest reseller, or give us a call at (800) 426-9400, Department HY8.

Over a million Lotus users have already made the switch[2] to Microsoft Excel: the spreadsheet for Windows.

Then you can see for yourself why the most innovative spreadsheet actually feels a little like magic.

Microsoft®
Making it easier

[2]Each year shows approximate total number of users who have switched. Microsoft Excel 4.0 for Windows has a 90-day money-back guarantee. [1]Plus freight and applicable sales tax. Offer good through February 28, 1993. For information only. In Canada, call (800) 563-9048; outside the U.S. and Canada, call (206) 936-6661. Microsoft is a registered trademark and Autosum.

With Microsoft Excel, making a great-looking chart has never been easier. That's because the ChartWizard tool helps you create smart-looking charts, step-by-step.

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Eight Personal-Finance Programs

Bank on Software for Easy Money Management

THE TOP CONTENDERS

Andrew Tobias' Managing Your Money 9.0
The financial-planning leader 294

Balance Point 1.1A
Last across the finish line 296

CheckFree 3.0
Inexpensive electronic bill-paying connection 300

Microsoft Money 2.0
A breeze to use, but where's the muscle? 302

MoneyCounts 7.0 Personal Edition
Accounting 101 mode palatable ... 302

Quicken 6.0
The DOS boss 304

Quicken for Windows 2.0
A Windows winner 308

WinCheck 3.0P
No heavyweight—but no wimp 310

By Chris Shipley

LOSE WEIGHT. QUIT smoking. Get a handle on your finances. These are the big three typical New Year's resolutions. PCs can't do much about the first two, but they can help you manage your hard-earned money.

Like dieting, managing personal finances requires choosing a program that works for you. While too much heavy-duty accounting may confuse you, a program that skimps on essentials may leave you wanting more.

We looked at eight popular personal-finance programs to find the best software for putting your financial house in order. Our objective: to identify programs that you can begin using with ease but that take you beyond simple checkbook management into more serious financial planning.

Once you clear the initial setup hurdle (and the best programs make this easy), you'll find PC-based check writing significantly faster than the old-fashioned pen-and-paper method. Because you enter a transaction only once and then either print and mail the check or electronically mail the payments, PC-based check writing is more accurate than its paper-based counterpart. Not to mention that PCs always keep track of your car and mortgage payment due dates. And they are unerring calculators.

Superior personal-finance programs provide something more: confidence and control. They ensure that you know how much money you have and how it's spent. When it's time to ante up for the IRS, they help you find every last deduction. When the credit-card company says your account is past due, you can quickly provide a complete payment history. When you're ready to buy a bigger house, you can dig up the records that your mortgage lender requires with a few keystrokes.

The best thing about personal-finance software is that they let you gain all these benefits by doing what you must do anyway—pay the bills. If you set up key budget categories such as tax-deductible expenses, salary and wages, and income withholding, and then record your checking account transactions in these categories, your personal-finance program can put a wealth of information at your fingertips.

Just as crash-dieting and quitting cigarettes cold turkey often fail, jumping headlong into using new personalfinance software can also be disastrous. Begin slowly and grow with the program. Start with a recent bank statement: Enter the latest bank balance and any checks written or deposits made since the closing date. (This method works even if you've never balanced your checkbook.) As you establish budget categories for transactions, focus first on tax-deductible ones,

Two Major Features at a Glance

Product	Number of Budget Categories:	Electronic Bill-Payment Connection?
Andrew Tobias' Managing Your Money 9.0	Limited by RAM and hard disk space	Yes
Balance Point 1.1A	128	No
CheckFree 3.0	100	Yes
Microsoft Money 2.0	253	Yes
MoneyCounts 7.0 Personal Edition	65,000	Yes
Quicken 6.0	Limited by RAM	Yes
Quicken 2.0 for Windows	600+	Yes
WinCheck 3.0P	512	No

The death of DOS Has been greatly exaggerated

DOS is still the preferred operating system on over 80% of the PCs in Fortune 1,000 companies, according to recent studies.

Bring Windowing Advantages to DOS.

Many Fortune 1,000 companies are using DESQview* as the best solution for keeping the dependability and familiarity of DOS programs and adding multitasking, windowing productivity. DESQview users give up nothing—since it actually runs MS Windows better should users wish to run Windows programs.

As you may know, DESQview 386 has been around for years, evolving into a highly efficient multitasking, windowing environment that extends the power of DOS, giving you increased productivity while conserving precious memory and disk space. In fact, the vast majority of 386 and 486 PCs need no additional memory or disk space to run DESQview.

DESQview 386 gives you pre-emptive multitasking like OS/2, but with ½th of the disk space and ¼th of the memory requirements. It gives you windowing like MS Windows, but with greater speed and efficiency and fewer 'crashes.' And DESQview lets you use a mouse or stick to the keyboard.

You Create the Standards; We Follow.

We've never been confused about our role. We believe software companies exist to make your job easier and your working day more productive. When publishers step out of that mold and begin to tell you what hardware you need and that you should throw out somebody else's perfectly good software—well, they simply are not operating in your best interest.

Software publishers don't create standards. You do. And whatever standard you choose, we support it.

If you like a program that only runs in MS Windows, like Wordperfect for Windows, DESQview 386 supports your choice. If you prefer a spreadsheet that runs in DOS, Lotus 1-2-3 Release 3, for example, we support that too. In fact, DESQview 386 lets you run your favorite DOS and Windows programs side-by-side.

DESQview adds multi-windowing, multitasking productivity to DOS

Have Your Cake and Eat It, Too.

DESQview 386 comes with QEMM-386, the number one memory management utility, and Quarterdeck Manifest, the award-winning memory analysis and monitoring program. Between them, they assure you every last 'K' of memory is put to use!* In many cases, QEMM can mean the difference between running the TSRs you want and not having enough memory.

And DESQview is an open doorway to the future, too. Our next step up, DESQview/X, opens your PC to a network full of possibilities, including graphic workstation standards—X Window System software—all while retaining the compatibility of DESQview.

If you're as committed to DOS as we are, and feeling left out by the so-called industry leaders, take heart. There's no reason to leave DOS. If more productivity is what you need, we can provide it.

Quarterdeck helps you get the most out of the hardware and software you own today.

Quarterdeck Circle 174 on reader service card.

Quarterdeck Office Systems, 150 Pico Boulevard, Santa Monica, CA 90405 (310) 392-9851 Fax (310) 314-4219
Quarterdeck International Ltd., B.I.M. House, Crofton Terrace, Dun Laoghaire Co. Dublin, Ireland Tel.(353) (1) 284-1444 Fax: (353) (1) 284-4380

* DESQview makes multitasking and windowing available to users of 286-class machines with similar memory efficiencies through QEMM-50/60 for IBM™ PS/® 50 and 60 users and QRAM for other 286 users.

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such as medical expenses and charitable contributions. As you enter more transactions, add new categories. There's no need to set budget amounts: Simply let your payment history provide a baseline against which future payments can be compared.

When trying to find the right personal-finance program, you may want to consider the following criteria that we used to evaluate the software:

PROGRAM SETUP. You won't use a finance program if you need an accounting degree to get started. We looked for programs with little jargon and easy setup. Several programs offer onscreen coaching to help you set up accounts and categories. Most programs have a check-writing module that resembles a paper check and/or check register. This interface eases the move from paper- to PC-based money management.

BANKING FUNCTIONS. A good financal-management program automates the routine tasks of checkbook management. Once you enter a transaction, the program should retain the information for the next time around. Superior programs even remind you when your next payment is due. Moving money between accounts should be a simple matter of pointing to one account and telling the program to transfer a specified amount to another account.

After you've transferred funds, paid bills, and recorded deposits, the program should help you reconcile your bank statement.

BUDGETING. What's the point of collecting all this data if you can't derive meaningful information from it? A finance manager should help you establish budget categories and let you add new categories on the fly. It should allow you to base a budget on the payment history and to apportion payments to multiple budget categories. Better programs will divide a budgeted figure over several months and even inflate or deflate it, applying the recalculated figure to future months.

Once you've collected a few months' worth of data, you'll want reports. Most programs print simple budget vs. actual reports, income and expense statements, and cash flow statements. Some even present income and expense distribution graphically.

PORTFOLIO MANAGEMENT. A number of programs offer simple tracking features, such as the ability to record investment purchases and sales, update prices, and record dividends. Some manage more complex tasks such as tracking tax lots or recording performance histories.

FINANCIAL AND TAX PLANNING. While you can gain insight into your finances with simple budgeting, adding financial and tax planning tools will help you develop a money-management strategy. A few programs offer sophisticated financial calculators for amortizing loans or setting savings targets. To varying degrees, these programs offer tax-planning advice—for example, some suggest how much tax to withhold from a paycheck. Although you may need these features only occasionally, they can be essential for setting up a realistic savings plan or for steering clear of an undue tax burden.

EXTRAS. By nature, personal-finance software is open to innovation. Some programs provide links to electronic

PAY BILLS WITHOUT LEAVING YOUR PC

In the world of banking, paper is a nuisance we could do without. A few companies, most notably Checkfree Corporation (800-882-5280, 614-898-6000) and Prodigy Service's Bill Pay USA (800-776-3449), help consumers give up the paper-check habit.

These services act as the agent between you and your creditors, transferring funds from your account to theirs. You simply tell the service the amount to send a payee and when. The electronic service does the rest.

Here's how it works, using Checkfree as an example. First, you write a check to a merchant using your personal-finance software if it links to the service. You supply the merchant's address and phone number, your account number, the amount of the payment, and the date. Rather than printing the check, you send it via modem to Checkfree. Checkfree processes the payment request and uses either the Federal Reserve or the MasterCard PRS system to transfer funds from your account to the merchant's. If for some reason Checkfree can't make the funds transfer electronically, it will print a check from your account and send it to the merchant via mail.

After years of testing, editors at *PC/Computing* have found electronic funds transfer to be more accurate than paper checks. There's no chance that someone will misread your handwriting, or worse, that your check will be crumpled in the bank's clearinghouse machinery. In fact, because you can schedule payments months in advance, you can ensure that you never miss a due date.

Checkfree's monthly service fee is $9.95 for the first 20 payments and $3.50 for each additional block of 10 payments. Bill Pay USA, for Prodigy members, costs $9.95 for the first 30 payments and $3.50 for each additional block of 10 payments. You can also pay a $110 annual fee with 360 payments.

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bill-paying services. Others include a raft of information-management tools, including calendars and notepads. And veteran money-management programs bridge the gap between software and data sources, such as credit-card and bank statements or electronic stock-quote feeds.

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PROGRAM SETUP. Once Managing Your Money is installed, an automated Hello, New User feature introduces you to the program's capabilities and conventions. Along the way, it asks a series of questions that helps you set up accounts. Even without this feature, account setup is simple. In a matter of minutes, we established checking, savings, money market, and credit-card accounts.

Managing Your Money operates on the premise that the real value in automating personal finances is the intelligence you gain from accumulated data. The program comes with established budget categories, many of which are associated with certain tax line items. We quickly modified these, deleting categories we didn't need and adding others we wanted to track.

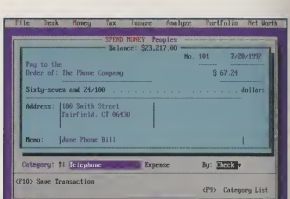
BANKING FUNCTIONS. Managing Your Money lets you record transactions in several ways. You can enter spend-and-receive transactions in an onscreen form or select items from the QuickPay list. This list includes both transactions that the program memorizes after initial entry as a check or a receipt, and items that you add manually. You can also add any transaction to an Alert list that pops up when you first load the program to remind you that particular items are due for payment or receipt.

The program tracks all accounts in a single file, which makes it easy to transfer funds between accounts using a point-and-shoot approach. Managing Your Money allows you to track loans and automatically transfer principal and interest payments, but the interface for these functions is more confusing than in some other finance managers.

Checkbook reconciliation is a straightforward matter in Managing Your Money. The program remembers your previous bank balance (or your opening account balance) and asks you for the new statement balance and date, plus any bank fees or interest payments that you've incurred. Then the program lists outstanding transactions by date, allowing you to review your statement and mark off transactions that have cleared your account. You can correct posting errors or add new transactions without leaving the reconciliation portion of the program. Once you've balanced your account, the program updates the check register, and you're through. A typical checkbook reconciliation takes only a few minutes.

BUDGETING. Managing Your Money contains an array of standard budget categories that you can modify. This prepared list not only lets you create budgets quickly but also supplies you with standard categories for tax purposes. As you write checks and enter deposits, you can assign the amounts to budget categories, split a transaction value among multiple categories, and easily add new budget categories as needed.

If you want to track budgets closely, Managing Your Money lets you assign dollar projections to each budget category. The program can copy a figure to all months and inflate or deflate a figure as it is copied. But most users will simply want past spending patterns to determine budget figures; Managing Your Money does this easily.



Managing Your Money lets you write a check by filling in an onscreen check or by selecting an item from a QuickPay list.

Once all the data is collected, Managing Your Money provides several ways to view it. The program offers preset reports showing budget vs. actual spending, distribution of income and expenses, and other basic information. Although the reports are useful, they don't identify the transactions that affect a particular budgeted figure, since all transactions in a budget category are grouped together for reporting.

PORTFOLIO MANAGEMENT. In Managing Your Money, we found the most complete portfolio-management capabilities of all the finance managers we reviewed. You can set up multiple investment accounts, including a "hypothetical" portfolio with which you can play the market without affecting your net-worth statements. The program tracks your investments as you buy, sell, and receive dividend income. More important, the program forecasts your tax liability and identifies sellable assets.

Managing Your Money includes innovative investment-management features; for example, it can automatically log on to Dow Jones to update stock prices and alert you when prices reach a specified threshold. You choose how often the program checks Dow Jones and how it alerts you—with an onscreen message, an audible beep, or a printed message, or by SkyTel pager.

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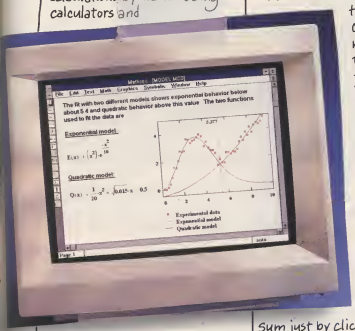

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FINANCIAL AND TAX PLANNING. Managing Your Money offers more financial and tax planning support than any other personal-finance package we reviewed. It includes about a dozen financial calculators to help determine which home you can afford to buy; whether you should refinance your mortgage; and how much to save for your retirement, the kids' college tuition, or savings goals. It includes a lease/buy analysis, a compound-interest calculator, and an investment-analysis function.

And Managing Your Money provides the most extensive tax planning resources, bar none. It includes a W-4 tax calculator to help determine withholding and a quick 1040 calculator that uses budget allocations to determine tax liability. The program will also dump your tax-related budget categories into TaxCut or TurboTax.

EXTRAS. Managing Your Money provides features for personal information management, including an appointment calendar, birthday and to-do lists, a contact database, and a simple word processor.

The program links to the Check-Free electronic bill-paying service and to Bill Pay USA, a bill-payment service provided through the Prodigy interactive network.

An insurance-planning section helps you estimate your life expectancy and determine how much insurance you need. The program provides a module to record vital information, including where you keep important documents; the names of your agent, broker, attorney, and doctor; and even information for your obituary.

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PROGRAM SETUP. You go it alone when you set up accounts with Balance Point. When you launch the program, you see a logo screen and the menu bar. That's it. The one sample checking file included with the program would be a good place to start, if only you could modify the opening balance. Fortunately, it's no headache to add your own accounts: Select New from the File menu, and a dialog box prompts you to add account information and type (checking, savings, other asset, or other liability). Unfortunately, there's not much thought behind the organization of these account types. All four use the same structure, the same preformatted budget categories, and so on. So when you create a liability account, you must enter an opening balance of $0, then enter the outstanding loan amount as your first transaction. It's manageable, but it's certainly not smart software design.

In fact, an unintelligent design is the hallmark of Balance Point. It's full of idiosyncrasies and annoyances. For instance, when the toolbar is open, the drop-down menus aren't active. And if you enter the date 1/19/93, you receive the error message "Dates Must be Between 01/01/1950 and 01/01/2100." Only the pure of heart can return to the date field and enter 01/19/1993 without cursing this design.

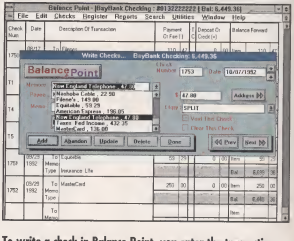
BANKING FUNCTIONS. Balance Point displays a check register, but it lets you enter transactions only in an Enter/Edit Register Items dialog box or a Write Checks window. In both cases, you enter a payment or credit by simply filling in blanks. You can assign any transaction to a budget category, but in the Write Checks window you will find you cannot divide a payment among multiple budget categories.

As you enter transactions, you can use the Memorize function to add payee or payer to a list of recurring transactions. Though memorizing recurring transactions is a handy capability, Balance Point's idiosyncrasies strike again. The Write Checks window (but not the Enter/Edit window) presents the list of memorized transactions in the order the transactions were memorized, not alphabetically for easy searching. And in both data-entry windows, the program will not fill in the memorized transaction automatically. You must pick the transaction from a list.

Balance Point treats each bank account as a separate file. You can transfer funds between accounts, but transactions memorized in one account aren't available in another account unless they were memorized separately.

The program handles checkbook reconciliation very simply. You enter the opening and closing amounts on your bank statement, enter any service charges and credits, then click off all transactions that have cleared. Balance Point sorts your register by credits and debits to make the process a little easier, displaying a running tally of cleared items along with any discrepancies. If you discover data-entry errors, you can't add or edit transactions as you reconcile. Instead, you must quit, return to the check register, make changes, then restart the reconciliation.

BUDGETING. Like most personal-finance packages, Balance Point provides preset budget categories that you can edit or modify. You'll need to look closely at the categories if you



To write a check in Balance Point, you enter the transaction in the above Write Checks window or in a special dialog box.

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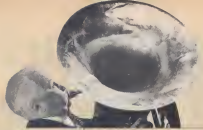

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486SX/25 "Honorable mention" October 13, 1992

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386DX/33 CACHE	Intel 80386DX-33 MHz 64K CPU cache	4 standard 32 max	120	as above	16 bit SVGA card & Hi-Color Support, 14" 1024 x 768 SVGA 28 Interlaced Color Monitor	$1,399 $52/mo*
486SX/33	Intel 80486SX-33 MHz 8K CPU cache	as above	120	as above	as above	$1,499 $56/mo*
486DX/33 CACHE	Intel 80486DX-33 MHz 128K CPU cache	as above	120	as above	16 bit SVGA card, 1MB Video RAM & Hi-Color Support, 14" 1024 x 768 SVGA Non-Interlaced Multisync Color Monitor	$1,799 $67/mo*
486DX/50 CACHE	Intel 80486DX-50 MHz 128K CPU cache True 50 MHz CPU	as above	120	as above	as above	$1,999 $74/mo*
486DX2/66 CACHE	Intel 80486DX2-66 MHz 128K CPU cache New Double Clock CPU	8 standard 32 max	200	as above	16 bit SVGA Superfast Windows Accelerator card, 1MB RAM, 14" 1024 x 768 SVGA Non-Interlaced Multisync Color Monitor	$2,499 $93/mo*

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want to use them for tax reporting and planning purposes—not all deductible categories (mortgage interest, for example) are designated as tax items.

You will also need to watch out for the program's confusing terminology. *Budget Items* and *Budget Categories* sound like the same thing, but they're not. Budget Items are the dollar amounts you assign to Budget Categories, which are your income and expense classifications.

It's helpful to be able to split a transaction among multiple budget categories. Though Balance Point lets you do this for budgeting, it doesn't help with the math.

Balance Point provides basic budget and financial reports in both personal and business categories, including graphical views of budget vs. actuals and cash flow reports.

✔**TIP** To save time, define dollar amounts for budget items when the amount is the same for most months. Set the amount in the Define Monthly Budget Items dialog box, then choose Define. This will enter the same figure for each month. Then change the figures for the months that differ.

PORTFOLIO MANAGEMENT. The program provides only the most basic portfolio management. You can enter investment transactions, but you can't enter partial shares. If you have multiple lots of the same stock or mutual fund, you must update each lot's price individually.

FINANCIAL AND TAX PLANNING. Besides a simple tax summary of items from the budget report, Balance Point offers no real tax- or financial-planning support.

EXTRAS. Balance Point is a plain and simple finance manager, so don't look for fancy extras. There is a Quicken data-import feature, but it won't be used much, considering the differences between the two programs.

CheckFree 3.0

☛ CHECKFREE MAY NOT BE THE MOST ROBUST FINANCE MANAGER, BUT IT EXPLOITS THE ADVANTAGES OF ELECTRONIC BILL PAYING LIKE NO OTHER. PLUS, IT'S REASONABLY PRICED.

CheckFree 3.0, $29.95 • Checkfree • 720 Greencrest Dr. Westerville, OH 43081 • (800) 882-5280, (614) 898-6000

PROGRAM SETUP. CheckFree is a checkbook-management package with simple but grand aspirations: to completely automate your bill paying. This straightforward package doesn't require any hand-holding. You can set up accounts without ever cracking open the manual.

CheckFree distinguishes between accounts that let you pay bills electronically and those that don't. For electronic CheckFree accounts, you can establish a list of merchants to pay electronically. (For related information, see "Pay Bills Without Leaving Your PC," page 292.)

BANKING FUNCTIONS. Using CheckFree is like having an automatic teller machine at your constant disposal. From your CheckFree account, you can pay any merchant quickly, schedule payments for months in advance, and even cancel payments (for a fee). All of these transactions are sent to Checkfree Corporation electronically and executed according to a schedule that you set.

Of course, the CheckFree software also lets you manage nonelectronic transactions—such as paper checks, deposits, and other ordinary checkbook-management chores.

The Reconcile module is fairly basic, asking you to first mark your cleared transactions, then enter your statement balance and choose Calculate to determine if your account balances. There is no provision for entering bank fees or interest in the Reconcile module; and if you find a mistake, you need to exit the Reconcile module and edit the transaction from the check-register view.

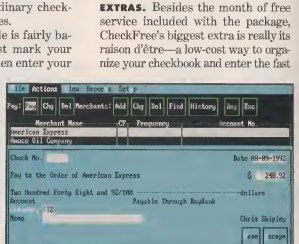
✔**TIP** To ensure that new electronic payments reach their destination on time, you may want to advance the payment date a few days. For example, if the payment is due on the 15th of the month, schedule it for the 10th. If the payment clears your account within a day or two of the scheduled day, move your payment date closer to the actual due date.

BUDGETING. CheckFree offers only basic budgeting capabilities. The program provides preset budget categories that you can edit or delete, and you can add your own categories. You can track transactions by category, then get annual or monthly reports from the system. Though you can't set budget amounts for each category, you gain a unique perspective on your spending: The budget report shows spending for a particular month, the category average, and the month's variance from that average in both dollars and percentages.

PORTFOLIO MANAGEMENT. As you might expect from a checkbook manager that costs less than $30, CheckFree doesn't provide portfolio tracking.

FINANCIAL AND TAX PLANNING. CheckFree leaves the financial planning to you, offering only budget reports and category listings as analysis tools.

EXTRAS. Besides the month of free service included with the package, CheckFree's biggest extra is really its raison d'être—a low-cost way to organize your checkbook and enter the fast



From CheckFree's Actions menu, you can make payments, review your check register, or record deposits.

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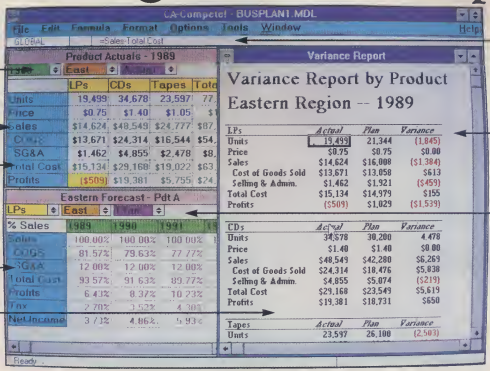

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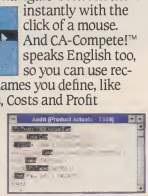

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and convenient world of electronic bill paying. To supplement the bill-paying service, CheckFree software provides an e-mail link to Checkfree Corporation's customer service department.

Checkfree's monthly service fee is $9.95 for the first 20 payments and $3.50 for each additional block of 10.

Microsoft Money 2.0

☛ THOUGH IT'S EXTREMELY EASY TO USE AND STRONG IN CHECKING AND BUDGETING, MICROSOFT MONEY LACKS PLANNING AND PORTFOLIO MUSCLE. WE RANKED IT BELOW QUICKEN AND MANAGING YOUR MONEY.

Microsoft Money 2.0, $69.95 • Microsoft • One Microsoft Way, Redmond, WA, 98052-6399 • (800) 426-9400, (206) 882-8080

PROGRAM SETUP. Of the personal-finance packages we reviewed, Microsoft Money is among the easiest to set up and use. The program includes an online coach that helps you set up accounts and enter the first few records. A small box appears at the bottom of the screen, telling you what to do and what type of information is appropriate to each blank. Short tips throughout the coach function suggest how to use it more efficiently. You can read just the opening screen or choose More to get in-depth help. If the coach becomes annoying, you can turn it off.

Money comes with preset categories for home and business expenses (or both combined) to make setting up budget categories easy.

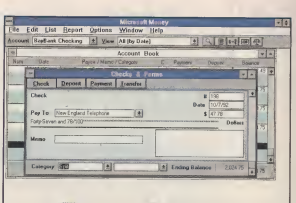
As you write checks, you can add a new budget category by typing it in the category field. And you can refine any category by breaking it into subcategories. For example, you might divide a telephone category into personal and business.

BANKING FUNCTIONS. Money makes managing your checkbook a snap. You create transactions by entering data into onscreen check and deposit windows. The program automatically memorizes each transaction, so once you've entered a payee's name, you never need to fill in the information again. With Money, check writing becomes a quick and painless task.

The program also handles links to loan accounts with aplomb. When you make payments from a checking account, those payments appear in loan records as well.

In addition, Money allows you to schedule your future transactions and reminds you when each comes due. And it makes checkbook reconciliation a breeze. You can enter statement balances, service charges, and interest earned. Money sorts transactions into debits and credits, and keeps a tally as you mark off cleared transactions. This makes finding the errors easy by helping you identify a missing deposit or check.

✔**TIP** Since Money continuously monitors the system clock to determine when to post reminders about scheduled payments, you should check the Windows Control Panel to ensure that the system calendar and clock are accurate.



Microsoft Money memorizes each transaction, so once you pay your phone bill, you never need to fill in that name again.

BUDGETING. Money's preformatted budget categories make it easy to track income and expenses. As with other programs, you can determine monthly spending targets, or you can use the AutoBudget feature to identify spending patterns in each category.

The program includes the usual collection of reports, including text and graphical representations of cash flow and budgets vs. actuals.

PORTFOLIO MANAGEMENT. As complete and easy to use as Money is, its lack of a portfolio manager will frustrate people who want to track the full range of their financial activities. There is no portfolio module, but as in other programs lacking this feature, you can create an asset account and track investments there. This approach, of course, doesn't automate price tracking and other functions as a true portfolio manager would.

FINANCIAL AND TAX PLANNING. Most of Money's financial- and tax-planning capabilities come as preformatted reports. The program reports tax categories, summarizes expenses, and provides budget reports. A simple loan calculator figures payments and prints an amortization schedule.

EXTRAS. Money allows you to classify expenses by project or client as well as by budget category. Certainly, other programs also allow you to do this, but Money is the only package we tried that makes this option obvious.

MoneyCounts 7.0 Personal Edition

☛ ONCE YOU MASTER THE ACCOUNTING JARGON, MONEYCOUNTS DELIVERS FULL-STRENGTH MONEY MANAGEMENT. IT'S LESS EXPENSIVE BUT ALSO LESS INTUITIVE THAN OTHER PROGRAMS.

MoneyCounts 7.0 Personal Edition, $49 • Parsons Technology • One Parsons Dr., P.O. Box 100, Hiawatha, IA 52233 • (800) 223-6925, (319) 395-9626

PROGRAM SETUP. MoneyCounts, though much improved in this version, is not a personal-finance manager for those who want quick-and-easy checkbook management. It takes time to get into this program, to understand the accounting structures, and to begin to manage accounts. However, the program does offer some help as you make your way. An accounting guide under the Help menu explains charts of accounts and other concepts that

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LOGITECH

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the average nonaccountant might not understand.

And while the program doesn't guide you through the setup of accounts and budgets (or chart of accounts), it does prompt you to create accounts and also provides charts of accounts for home, business, farm, church, and rental properties.

✔**TIP** To import MoneyCounts 6.5 data, use the IMPORT.BAT file in the MoneyCounts 7.0 directory; it'll walk you through the process.

BANKING FUNCTIONS. If you make it through setting up accounts, you'll be delighted with the program's simple checkbook interface. From here you handle most banking chores by choosing tasks from pull-down menus.

As with other programs, you can assign transactions to budget categories or split a transaction among 1,000 categories. And you can establish automatic entries for recurring transactions, triggering the program to remind you of payments due.

MoneyCounts lets you decide whether to make each type of account reconcilable. For example, you'll want to reconcile your checking account, but you may not need to reconcile an expense-tracking account. The process of balancing an account is similar to those of other programs. You enter your statement information, then mark cleared transactions. MoneyCounts keeps a tally this and allows you to add or edit transactions along the way.

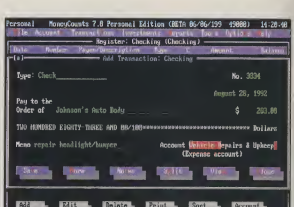
BUDGETING. Budgeting in MoneyCounts first requires an understanding of a chart of accounts. You can assign any transaction to a budget category and extract collected information, creating a series of preformatted reports. Because of it's emphasis on accounting features, MoneyCounts has the most extensive collection of report formats of the personal-finance programs we review.

PORTFOLIO MANAGEMENT. MoneyCounts includes a portfolio manager for tracking securities and other investments. You can record expenses and income related to the portfolio as well as update prices. As with budgeting, there are several ways to examine information you capture in the portfolio, including charts and graphs.

FINANCIAL AND TAX PLANNING. MoneyCounts has a neat tax-at-a-glance feature that quickly tallies income and deductions and provides estimated tax for the year. A handy program, it can help you monitor and reduce your tax liability.

There's also a simple loan calculator that determines payment or principal amounts based on information you provide.

EXTRAS. In addition to the free accounting lesson, MoneyCounts throws in a few handy information-management tools, including an address book, a calendar, and a notepad. These are useful for keeping your financial records, such as the names and numbers of your banker, broker, insurance agent, and so on.



MoneyCounts' interface lets you easily handle most banking functions, such as check writing, via pull-down menus.

Quicken 6.0

☛ QUICKEN PUTS POWERFUL FINANCIAL-MANAGEMENT TOOLS WITHIN EASY REACH OF ANY PC USER. THE PROGRAM'S EXCELLENT REPUTATION IS WELL DESERVED; QUICKEN IS ONE OF OUR FAVORITES (AND ITS PRICE IS COMPETITIVE, TOO).

Quicken 6.0, $69.95 • Intuit • P.O. Box 3014, Menlo Park, CA 94026 • (800) 624-8742, (415) 852-9696

PROGRAM SETUP. When you launch Quicken, a tutuorial pops up to take you on a tour of the program. After the ten-minute tour, you'll know everything about Quicken and you'll have already set up your first accounts. In case you miss something along the way, the program offers excellent online help with a scrollable index of help topics.

Quicken provides budget categories for personal and business classifications; you can use one or both with your accounts. You can also add or modify categories.

✔**TIP** Quicken provides many keyboard shortcuts. For example, to jump to the end of the check register, press Ctrl-End.

BANKING FUNCTIONS. Quicken makes managing finances as simple as writing traditional paper checks—but with Quicken you can do the job faster and more efficiently, and collect a lot of data along the way.

Quicken memorizes transactions with each check and deposit you record. You can easily transfer funds from account to account, and the program provides excellent links between your checking account and loan account records. The program's objective—that you need to enter data only once—is gracefully achieved.

Quicken lets you set up a schedule for paying recurring bills. A separate BillMinder utility installs itself in your AUTOEXEC.BAT file and pops up to remind you when scheduled payments are due.

The program also provides two methods for checkbook reconciliation. The standard reconciliation module asks for statement balances, bank fees, and interest, then sorts transactions by deposits and withdrawals. As you click off cleared items, Quicken keeps a running record of the overall difference and the number of cleared deposits and credits. When you see totals broken out in this way, it's easy to discover mistakes. If you find an error, you can edit or add a transac-

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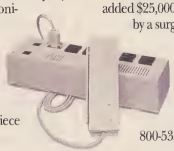
The review stated, "Kensington could have stopped with adding phone/modem surge protection while still offering good value." It then went on, "but the company went a step further and included power-line monitoring and a low-voltage warning system."

Well, this year the value is even greater. For greater surge protection, the joule rating has been increased to 420 on MasterPiece Plus and MasterPiece Plus Remote. The low voltage indicator on MasterPiece Plus features an alert light and a buzzer alarm. All three MasterPiece Products now have full 15 amp circuit breakers.



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KENSINGTON

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800# Assistance	7 Days/ 18 Hours	7 Days/ 24 Hours#	7 Days/ 24 Hours
Trade-in Program	No	No	Yes
Licensed Education Centers	No	No	Yes
30-Day Money-Back Guarantee	Yes	No	Yes

Sources: Dataquest Ledgeway, 7/92. COMPAQ News Release, 10/5/92.
*Applies to COMPAQ ProSignia®, COMPAQ SYSTEMPRO®/XL and associated options only. The service, provided by contracted service providers, may not be available in certain geographic locations.

IBM®

tion from within the reconciliation program.

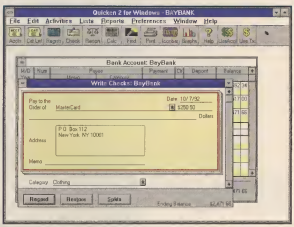
The second reconciliation method is Quicken's Accuret service, which works in conjunction with several large regional banks. Participating banks will send your monthly statement on hard copy and floppy disk. Insert the disk into your computer and launch the reconciliation, and Quicken does the rest—comparing bank entries with your entries and asking you to resolve discrepancies. Though Accuret is the fastest and most accurate way to reconcile accounts, it's most useful for people who make many monthly transactions.

BUDGETING. It couldn't be easier to set up a budget with Quicken. The program comes with preset categories for home and business, which you can use and modify. Like similar features in Microsoft Money and Managing Your Money, Quicken's Auto Create option sets up budget targets based on past spending and income patterns.

The program provides a number of personal and business reports, including cash flow, monthly budget, profit and loss, accounts payable and receivable, and so on. You can customize each report by selecting from a series of options to create a specific report format.

Quicken now graphs many of these report-generated numbers, too. There are preset graphs for monthly income and expense statements, assets and liabilities, budgets vs. actuals, and investment tracking.

The most helpful part of Quicken's reporting, though, is QuickZoom, which lets you examine any reported number to see transactions that affected that number. It's a feature unavailable in other personal-finance managers and one that brings real intelligence to budget reporting.



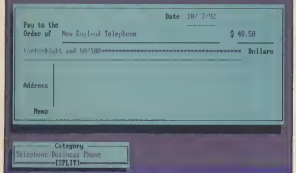
Quicken for Windows automatically fills in payee names for recurring transactions and splits payments among categories.

PORTFOLIO MANAGEMENT. Quicken's portfolio-management module may not have all the bells and whistles of Managing Your Money, but it offers just about everything the average investor might need. You can record investments as you buy and sell, update prices, and reconcile your investment account with your monthly statement. Quicken even keeps an historical record of price updates so that you can track the performance of an investment over time.

FINANCIAL AND TAX PLANNING. Quicken offers the usual complement of financial planning tools. The program includes a loan calculator; investment, tuition, and retirement planners; and a refinance calculator. Each tool is straightforward, and online help explains unfamiliar terms.

Tax planning is limited to budget reports that are broken out into appropriate tax-schedule items.

EXTRAS. Quicken for Windows, like Managing Your Money, has a built-in link to the Checkfree electronic bill-paying service. It also includes a calendar as well as an onscreen supply-ordering utility.



The DOS version of Quicken lets you set up separate business and personal accounts and split a transaction between them.

Quicken for Windows 2.0

☛ QUICKEN FOR WINDOWS IS THE UNCONTESTED CHAMPION OF WINDOWS FINANCIAL MANAGERS. ALONG WITH ITS DOS COUNTERPART, IT TOPS OUR LIST.

Quicken for Windows 2.0 • Intuit • P.O. Box 3014, Menlo Park, CA 94026 • (800) 624-8742, (415) 852-9696

PROGRAM SETUP. There isn't any quicker, easier, smarter way to computerize your finances than by using Quicken for Windows 2.0. Like its DOS counterpart, Quicken for Windows walks you through setting up accounts, explaining what kind of record keeping is appropriate for each account type (bank, credit, liability, asset, and so on).

BANKING FUNCTIONS. If you can write a check, you can use Quicken for Windows. Like the DOS version, Quicken for Windows memorizes transactions as you write them, so you never have to completely fill out a check to the same payee twice. When you're working with several accounts, each appears in its own window; the program also helps you avoid confusing accounts by color-coding the check registers.

Quicken provides all the usual budgeting support, allowing you to split transactions among multiple budget categories.

Reconciling accounts is a snap.

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Quicken remembers your last statement balance, asks for the pertinent information, then keeps a running tally of debits, credits, and the difference between the bank's balance and yours. Along the way, the program provides onscreen help to explain the procedures and purposes of account reconciliation.

BUDGETING. Quicken for Windows lets you construct a biweekly, monthly, quarterly, or yearly budget. If you set up your budget with yearly targets, the program automatically calculates the monthly target, and vice versa. Quicken for Windows can also automatically create a budget by using your past spending patterns as the starting point.

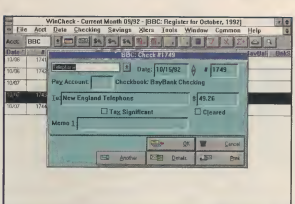
The program outdoes every finance manager (except Quicken for DOS) at designing budget reports with investigative muscle. The QuickZoom feature lets you examine any budget report and find the transactions that affected the final result.

PORTFOLIO MANAGEMENT. Like Quicken for DOS, the Windows version offers all the portfolio management that most investors need. The program handles buy and sell transactions, income reinvestment, stock splits, and a number of other basic investment possibilities. It tracks all price modifications and keeps a running record of an investment's price history, as well as the overall value of your portfolio.

FINANCIAL AND TAX PLANNING. If Quicken for Windows has a weak link, it's in financial planning. The program includes some basic calculators to help determine college and retirement savings. A Loan Planner can calculate monthly payments based on an initial loan amount, or a loan amount based on a desired monthly payment.

Tax planning comes in the form of budget reports, although Intuit does offer a $19.95 add-in package, called the Quicken Companion, that includes a tax estimator and other tools.

EXTRAS. Intuit has made great strides in recent years to completely automate personal-finance record keeping. In addition to its Accuret reconciliation service, Intuit (in conjunction with Primerica Bank) now offers IntelliCharge, a Visa gold card. IntelliCharge works like any other credit card—with a twist. Aside from sending a monthly credit-card statement, Primerica Bank lets you dial in to access your own electronic statement, which sorts purchases into budget categories and uploads that information into Quicken.



WinCheck offers the same onscreen check feature as all the other programs, but it also includes icons for easy data entry.

PC Contact

WinCheck 3.0P

☛ THOUGH WINCHECK IS CERTAINLY NO HEAVYWEIGHT, IT'S NO WIMP, EITHER. BUT DON'T TAKE OUR WORD FOR IT—YOU CAN TRY IT BEFORE YOU BUY IT.

WinCheck 3.0P, $69.99 • Wilson WindowWare • 2701 California Ave. SW, Suite 212, Seattle, WA 98116 • (800) 762-8383, (206) 938-1743

PROGRAM SETUP. WinCheck comes in two forms: as a commercial program available directly from Wilson WindowWare or as shareware distributed online (look for it on PC/Contact, *PC/Computing*'s CompuServe forum, as WINCHK21P in data library 3 [Utilities & Misc.]; check page 276 for logon instructions). The only difference between the two is that the shareware version is riddled with reminders to send in the $69.99 registration fee. Once you fulfull that obligation, you'll receive a manual, a reminder-free version, technical support, and of course, the peace of mind that comes with knowing you did the right thing by registering your copy.

WinCheck comes with a tutorial account, which is probably a good place to learn the program's ins and outs. Once you've found your way, setting up a new account is simple. WinCheck supports three account types: checking or cash, savings, and credit card. Budget categories are preset and you can modify, delete, or add to these as needed.

BANKING FUNCTIONS. Like the other programs, WinCheck uses an onscreen form for entering income and expense transactions easily, but it also provides icons across the top of the screen for quick data entry. The most interesting of these is the ATM icon, which lets you quickly record cash machine withdrawals from checking or savings accounts.

WinCheck handles routine banking functions, including transfers between accounts, with little problem. It doesn't memorize recurring transactions automatically, though. You'll need to enter these transactions separately in a list of common transactions or select the items you want memorized from the check register. Choosing memorized transactions is just as cumbersome. The program asks you to select the payee from a list each time, rather than filling in the blank automatically.

One nice feature in WinCheck is that it can schedule payments for future dates and then remind you when a transaction is due. WinCheck alerts you when a payment is due within a set number of days and automatically fills in your checkbook entry when the payment comes due.

The program also has a Reconciliation Helper to make short work of that dreaded banking chore. WinCheck sorts transactions first into deposits, then into withdrawals. You mark off

9.1.1

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cleared transactions, editing or adding transactions as necessary. When you're through, if the account doesn't balance, the program enters the difference as a bank error so that the account balances.

✔**TIP** Since WinCheck has no built-in way to delete accounts, you must use the Windows File Manager to delete files that have your account ID as an extension.

BUDGETING. WinCheck doesn't provide much budgeting support. You can enter target amounts for each budget category, but the program cannot generate a budget for you based on previous transactions. The program includes all the standard budget reports, which you can modify for your own purposes.

PORTFOLIO MANAGEMENT. WinCheck does not claim to be a portfolio manager. The program doesn't provide any support for investment tracking except for what you can manage within the confines of a regular cash account.

FINANCIAL AND TAX PLANNING. You won't find financial calculators or tax reports in WinCheck—except for budget data that you can extract by tax categories. If your money-management needs include tax planning, turn to Managing Your Money.

✔**TIP** Double-clicking on the right mouse button in an amount or $ field calls up the Windows calculator. Make your calculation and press Ctrl-Ins to copy the result. Close the calculator, place your cursor in the amount field, and press Shift-Ins to paste the result into the field.

EXTRAS. Perhaps because of wishful thinking, WinCheck includes a Quicken data converter for older versions of Quicken—by the time you read this, the converter should include a converter for the latest versions. Despite WinCheck's best efforts, however, it's not Quicken—and it's likely that few people actually use the converter.

Contact Working Smarter at *PC/Computing*, 950 Tower Lane, 20th Floor, Foster City, CA 94404, or use PC/Contact to drop us a line via CIS mail (address 76000,21).

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PERIPHERALS
INSIGHT/HARD DRIVES INT'L 324-327
ARLINGTON COMPUTER PRODUCTS . 322
USA FLEX 334

PRINTERS
INSIGHT/HARD DRIVES INT'L 324-327
USA FLEX 334
PRINTERS PLUS 338

SOFTWARE
SOFTDIRECT 328
COMPUCLASSICS 323
INSIGHT/HARD DRIVES INT'L 324-327
REASONABLE SOLUTIONS 329
QUICK ELECTRONICS 335

MEMORY
INSIGHT/HARD DRIVES INT'L 324-327
LA TRADE 330
WORLDWIDE TECHNOLOGIES .. 337

NOTEBOOKS
INSIGHT COMPUTERS 325

STORAGE
HARD DRIVES INT'L 326

MULTIMEDIA
INSIGHT/HARD DRIVES INT'L 324-327

ON-LINE
NATIONAL VIDEOTEX 336

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COMPUTER BOOK CLUB 331-333

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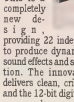

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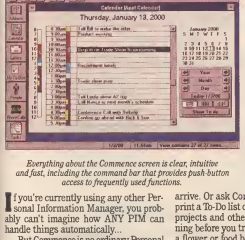

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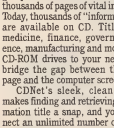

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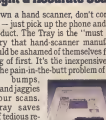

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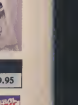

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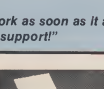

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Note: These games require EGA or VGA graphics and a hard Drive

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(CGA) Color Graphic Adapter (EGA) EGA Graphics (HD) Hard Disk

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Note: These titles require Windows 3.0 or 3.1

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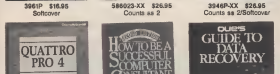

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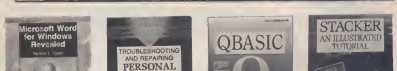

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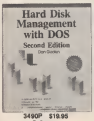

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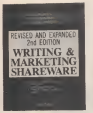

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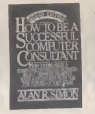

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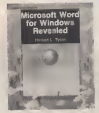

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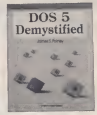

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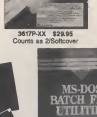

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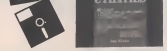

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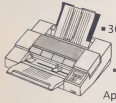

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Index

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HARDWARE		
Add-in-Boards	348	
Bar Coding		353
Cables		
CD-Rom	349	354
Communications	348	
Computer Insurance		354
Computer Systems		354
Connectivity		
Cooling Devices		
Disk Drives		
Diskettes		
Expansion Units		
Input Devices		
Memory Upgrades		
Monitors		
Peripherals	349	354
Power Supplies/Protection		
Printers		
Security		
Voice Mail	349	
SOFTWARE		
Accounting		
Artificial Intelligence		
Bar Coding		
Business	349	355
Business Time Management		
Communications/Networking		
Construction		
Copy Protection		
Database		
Desktop Publishing		
Data Recovery	350	
Duplication		
Education		355
Emulation		
Entertainment/Games		355
Financial		355
Fonts	349	
Foreign Languages	352	355
Forms Processing		
General		
Graphics	350	
Health		
Inventory		
Legal		
Mailing Programs		355
Marine		

PRODUCT CATEGORY	PREMIER	CLASSIFIED
SOFTWARE (CONT.)		
Medical/Dental		
Membership Software		355
Music/MIDI		
Payroll/Accounting		
Personal Productivity		
Programmers Tools		
Project Mgmt. Systems		
Public Domain		355
Real Estate		
Religion	350	356
Sales Marketing		
Scientific/Statistics		356
Sales Marketing		
Security		
Services		
Shareware		
Spread Sheets		
Sports		356
Taxes		
Utilities	351	
Windows		356
PC/MISCELLANEOUS		
Accessories/Supplies		356
Books/Catalogues		357
Business Opportunities		357
Data Conversion		
Diskette Copy Services		
Employment Opportunities		
Entertainment		
On-Line Services	352	357
Publications/Videos		
Services		357
Slide-Imaging Services		357
Toner Cartridge Refills		357
Training		

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ADVERTISER INDEX

ADVERTISER	READER SERVICE	PAGE NUMBER
3-D Visions	185	199
Abacus	138	35
	244	37
Addstor Inc.	162	116
Advanced Logic Research	142	166-167
Americo Online, Inc.	*	145-146
American Power Conversion	116	33
Ariel Design Inc.	147	36
Arlington Computer Products	161	322
ASP Computer Products	122	18
AST Computer	196	44-45
ATI Technologies Inc.	112	107
Autodesk Retail	171	181
	118	275
Borland International	201	143
Broderbund Software	*	125
	*	265
Caere Corp	272	239
Central Point Software	249	253-255
Claris Corporation	*	38-39
Clear Software	144	16
Colorado Memory Systems	259	200
Compuodd Corporation	200	221-226
CompuClassics	154	206
	210	323
Compudyne	195	298-299
Compuserve	128	311
Computer Associates	262	17
	246	237
	121	301
Computer Book Club	106	331-333
Concentric Data Systems	322	259
Corel Corp.	218	15
Creative Labs	211	110-111
Crosstalk	129	115
Curtis Mfg Co	*	9
Doc Easy	229	182
	245	251
Dataproducts	170	283
Dell Computer Corp.	*	C5-C8
	*	126-127
	*	285
	*	86-87
Delrina Technology	335	105
	318	57
Dustin Discount Software	209	19
	145	2-3
	274	28
Egghead Software	198	89
Expervision	113	70-71
Fast Micro	158	177
Fifth Generation Systems	175	233
Gateway 2000	*	312-313
	*	73-80
Hard Drives Int'l	*	326
Hewlett Packard Peripheral	*	4-5
	*	47
Hyundai Electronics America	*	159
	108	160-161
	127	162-163
	133	164
IBM	*	140-141
	*	306-307
Ingram Micro D	*	247
Insight Computers	*	325
Insight Distribution	*	324
Insight Software	*	327
Intel Corp	184	12-13
Intuit, Inc.	*	91
	*	93
Invisible Software	263	31
Kensington Microware	190	305
Kingston Technology Corp.	213	219
L.A. Trade	*	330
Laser Master	199	269
	258	271
Logitech	253	203
	177	303
Lotus Development Corp	*	152
	*	184-185
	*	228-229
	203	277
	*	98-99
M-USA Business Systems	166	132
MathSoft Inc	206	295
Maynord / Irwin	104	34
Meco Software Inc.	*	194
	*	83
Medio Vision	114	131
Micro Logic Corp	*	103
Micrografx	255	216
Microsoft		215
	*	249
	*	288-289
	*	61-65
	*	67
	*	69
Microtac Software	223	123
Nonoo	212	293
National Videotex	157	336
NEC Technologies	168	135
	220	C2-PG1
	217	235
New Vision Technologies Inc.	362	207
Northgate Computer Systems	*	208-209
	164	210-211
NRI Schools	*	297
Number Nine Computers	115	95
Okidata	237	124
Pacific Data Products, Inc.	*	309
Panasonic	257	193
Patton & Patton	224	316
PC Brand	*	243-246
PC's Compleat	110	320-321
Peachtree Software	325	11
Power Up Software	120	136
	254	241
Printers Plus	*	338
QMS	137	147
Qualitas Inc.	123	190
Quantum Corp.	156	257
Quarterdeck Office Systems	174	291
Quick Electronics, Inc.	197	335
Reasonable Solutions	119	329
SoftDirect	150	328
Software Spectrum	169	204
SPSS	130	287
STAC Electronics	194	266-267
Tigersoftware	193	318-319
Toshiba Americo, Inc.	215	278-279
Truevision Inc	266	189
UMAX	363	178
USA Flex	183	334
Verbatim Corp	143	109
ViewSonic	186	151
Word Perfect Corporation	*	273
Wordstar	252	14
	188	30
	269	81
World Wide Technologies	*	337
Xante Corporation	178	85
Zenith Data Systems	148	49-56
Zeas Int'l	131	101
	139	21
	248	22-23
	111	24-25
	216	26-27

Direct to You Section	317-338
PC/Computing Marketplace	339-357

PC/Computing (ISSN 0899-1847) is published monthly by Ziff-Davis Publishing Company, a division of Ziff Communications Company, One Park Ave., New York, NY 10016. Second Class postage paid at New York, NY 10016 and at additional mailing offices. Postmaster: Send address changes to *PC/Computing*, P.O. Box 58229, Boulder, CO 80321-8229.

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PRODUCTS FEATURED IN ADVERTISEMENTS

101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125
126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175
176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200
201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225
226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250
251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275
276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300
301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325
326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350
351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375
376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400
401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425
426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450
451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475
476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500
501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525
526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550
551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575
576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600

PRODUCTS FEATURED IN EDITORIAL

601	602	603	604	605	606	607	608	609	610	611	612	613	614	615
616	617	618	619	620	621	622	623	624	625	626	627	628	629	630
631	632	633	634	635	636	637	638	639	640	641	642	643	644	645
646	647	648	649	650	651	652	653	654	655	656	657	658	659	660
661	662	663	664	665	666	667	668	669	670	671	672	673	674	675
676	677	678	679	680	681	682	683	684	685	686	687	688	689	690
691	692	693	694	695	696	697	698	699	700	701	702	703	704	705
706	707	708	709	710	711	712	713	714	715	716	717	718	719	720
721	722	723	724	725	726	727	728	729	730	731	732	733	734	735
736	737	738	739	740	741	742	743	744	745	746	747	748	749	750
751	752	753	754	755	756	757	758	759	760	761	762	763	764	765
766	767	768	769	770	771	772	773	774	775	776	777	778	779	780
781	782	783	784	785	786	787	788	789	790	791	792	793	794	795
796	797	798	799	800	801	802	803	804	805	806	807	808	809	810
811	812	813	814	815	816	817	818	819	820	821	822	823	824	825
826	827	828	829	830	831	832	833	834	835	836	837	838	839	840
841	842	843	844	845	846	847	848	849	850	851	852	853	854	855
856	857	858	859	860	861	862	863	864	865	866	867	868	869	870
871	872	873	874	875	876	877	878	879	880	881	882	883	884	885
886	887	888	889	890	891	892	893	894	895	896	897	898	899	900

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1. **Where do you use your computer?** (Check one only)
   A ☐ Home B ☐ Business C. ☐ Both
2. **What kinds of computers do you use?** (Check all that apply)
   D. ☐ IBM/Compatible Laptop E ☐ IBM/Compatible Desktop F ☐ MAC
3. **Do you plan to buy any of the hardware or software mentioned below in the next three months?** (Check all that apply)

HARDWARE
G. ☐ PC
H ☐ MAC
I. ☐ Laptop
J ☐ Printer
K ☐ Monitor
L ☐ Disk/Tape Back-up
M ☐ Add-in Board
N ☐ Modem
O. ☐ Input Device
P ☐ Local Area Network

SOFTWARE
Q ☐ Accounting
R ☐ Spreadsheet
S ☐ Personal Finance
T. ☐ Desktop Publishing
U ☐ Word Processor
V ☐ Database Manager
W ☐ Graphics
X. ☐ Utility
Y ☐ Communications
Z ☐ Windows/Multi-tasking
1 ☐ Programming Language/ Compiler
2 ☐ Integrated/Multifunction
3 ☐ CAD

4. **From which of the following sources do you purchase personal computer products?** (Check all that apply)
   4 ☐ Specialty Computer Retail Stores 6 ☐ Direct from Manufacturers
   5 ☐ Mail Order Firms 7 ☐ Other

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126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175
176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200
201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225
226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250
251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275
276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300
301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325
326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350
351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375
376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400
401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425
426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450
451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475
476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500
501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525
526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550
551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575
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631	632	633	634	635	636	637	638	639	640	641	642	643	644	645
646	647	648	649	650	651	652	653	654	655	656	657	658	659	660
661	662	663	664	665	666	667	668	669	670	671	672	673	674	675
676	677	678	679	680	681	682	683	684	685	686	687	688	689	690
691	692	693	694	695	696	697	698	699	700	701	702	703	704	705
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721	722	723	724	725	726	727	728	729	730	731	732	733	734	735
736	737	738	739	740	741	742	743	744	745	746	747	748	749	750
751	752	753	754	755	756	757	758	759	760	761	762	763	764	765
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796	797	798	799	800	801	802	803	804	805	806	807	808	809	810
811	812	813	814	815	816	817	818	819	820	821	822	823	824	825
826	827	828	829	830	831	832	833	834	835	836	837	838	839	840
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CCC-6179.33

24 PIN
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- 63 CPS LQ
- IBM and Epson Compatibility
- 7-Fonts • 11.7" Narrow Carriage
- Paper Parking • PUSH-PULL Tractor
- Rear, Bottom, and Top Paper Feed
- 20 Function Operator Panel Controls
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$229
CCC-6254.17

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- 100 CPS LQ • Parallel Interface
- IBM and Epson Compatibility
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- PUSH-PULL Tractor
- 16 LCD Operator Panel Controls
- Rear, Bottom, and Front Paper Feed
- 16.9"W x 14.1"D x 5.6"H
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QUIET 24-PIN COLOR CAPABLE

$219
CCC-6224.92

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- Adobe Type Manager Software
- PUSH-PULL Tractor • Paper Parking
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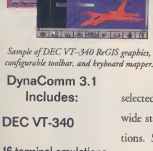

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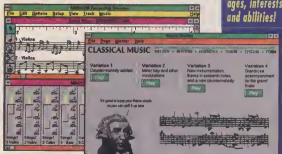

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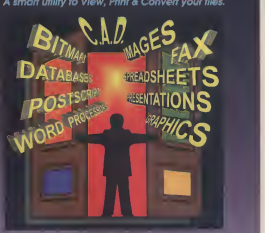

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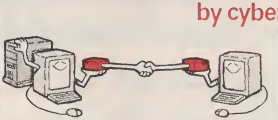

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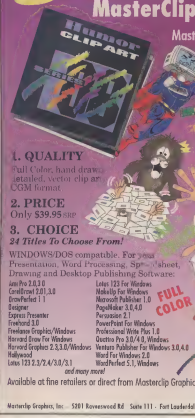

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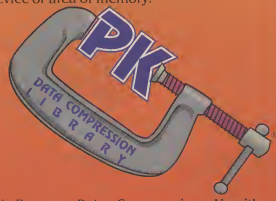

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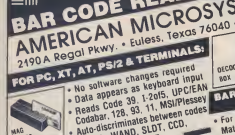

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Source: 1992 Buying Trends Market Study Wave 3

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Source: 1st Half 1992 Buying Trends Market Study, Base: employed subscribers

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Source: 1st Half 1992 Buying Trends Market Study, Base: employed subscribers

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PC/Computing subscribers buy direct.

9 out of 10 PC/Computing subscribers took action upon reading mail order or direct from manufacturer ads. In the past 12 months...

- 66% purchased a product
- 54% brought ads to the attention of colleagues/friends
- 49% called a mail order company to get more information
- 42% decided to purchase something In the near future

Call for action in PC/Computing Marketplace.
Call today for advertising information, 800-825-4237

Source: PC/Computing Mail Order Market Study, Spring 1992

A Brief History of Time: The Column

Talkin' about Screamin' Steve Hawking and watchin' the cursor fly across the screen.

YOU JUST KNOW that when the book *A Brief History of Time* came out and no one was reading it but everyone was buying it, many witty jokesters said to their friends, "Yeah, I'll wait and see the movie." You just know some funny folks said that. And you just know their friends laughed. It's a good joke.

So, now there is a movie of *A Brief History of Time* and . . . what's the call on this? What happens when your jokes become reality? Ask H. Ross Perot.

So I saw *A Brief History of Time: The Movie*, when it opened last September, but it takes me some time to get around to writing. Then the copy editors have to spend time taking out words to make it fit on one page. Then I argue about which words to take out. ("Yeah, I know I use the phrase *you just know* three times in the opening paragraph, but I like the way it sounds. Yeah, no one reads my columns aloud but you can't cut *you just know*. And you can't cut the three *yeahs* at the beginning of the quotes. You just can't. Cut anything else. I don't care, cut the last five words of the goddamn column if you have to, but don't cut *you just know*. Please.") Then the artist has to get the draft and decide how to put my four-eyed fat face into an appropriate picture. (I wonder what would happen if I put a non sequitur, phony reference in the middle of the page about, oh let's say, me sitting around in my underwear playing Nintendo and eating pizza with Bill Clinton and Uma Thurman. Would Caty Bartholomew read the column, see Bill Clinton, Uma Thurman, Nintendo, and pizza mentioned twice, have that image stick in her mind, and paint an illustration that has nothing to do with the column? Let's find out.)

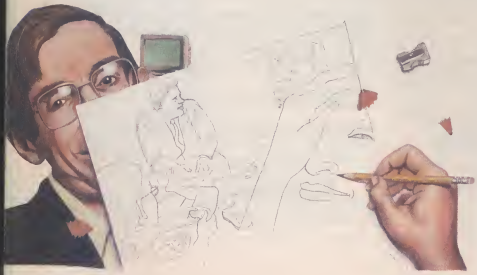
So by the time this magazine gets into your hot little hands, the movie is in the "previously viewed" rack at the local mom-and-pop video joint.

But right now (about three months ago), I'm really jazzed about *A Brief History of Time*. Screamin' Steve Hawking is just so cool. Errol Morris, the movie maker, is not afraid to show a funny, hip genius who happens to have ALS (Lou Gehrig's Disease). [For once I'm not using parentheses where I don't need them—everyone who writes about little Stevie writes "ALS (Lou Gehrig's Disease)."]

We see Hawking in his wheelchair. He can move only a couple of his fingers, and he can't talk. When we hear him talk, we hear his computer talk. It's just a PC, and that's what's so cool. Hawking watches the cursor fly across the alphabet, and he hits the button when it gets to the first letter of the word he wants to say. The cursor starts flying across words beginning with that letter, and he hits the button again when he gets to the right word, and the computer says it aloud. Then the computer takes a guess at the next word, giving him several choices of words we all say often, like *the*, *a*, *and*, and *is*. If it's one of those, he hits the button and he's golden, and if it's not, the cursor moves through the alphabet again.

My info on the workings of this software is old, so I bet by now it guesses the most likely words from a personalized word list. If it were set for me, the first choices would be *cool*, *you know*, and *Uma*, and I'd wait until I could use those three modules in a row as a question and try to finagle an introduction.

The movie doesn't make a big deal out of the computer. It's just a tool. As a technology cheerleader, I was thrilled. Because of a lowly PC, we are able to hear what this way cool guy is thinking, and that's the



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CUSTOMER SATISFACTION SURVEY

Source: Reliability Ratings 1992 PC Vendor Survey

SERVICE	TECHNICAL SUPPORT	PRICE	RELIABILITY	UPGRADEABILITY	FUNCTIONALITY	MONITOR	OVERALL SATISFACTION
1. DELL (8.82)	**1. DELL** (8.58)	**1. DELL** (8.62)	**1. DELL** (8.98)	**1. DELL** (8.52)	**1. DELL** (8.72)	**1. DELL** (8.71)	**1. DELL** (8.73)
2. APPLE (8.08)	2. IBM (7.98)	2. COMPAQ (8.42)	2. COMPAQ (8.95)	2. APPLE (7.54)	2. COMPAQ (8.45)	2. APPLE (8.09)	2. COMPAQ (8.45)
3. IBM (8.01)	3. APPLE (7.73)	3. APPLE (8.58)	3. APPLE (8.58)	3. COMPAQ (7.48)	3. APPLE (8.40)	3. COMPAQ (7.93)	3. APPLE (8.34)
4. COMPAQ (8.00)	4. COMPAQ (7.71)	4. IBM (8.01)	4. IBM (8.54)	4. IBM (6.97)	4. IBM (7.95)	4. IBM (7.39)	4. IBM (7.88)

Survey was independently conducted by Reliability Ratings, Inc., a subscriber-based research firm that does business with most of the FORTUNE 500.

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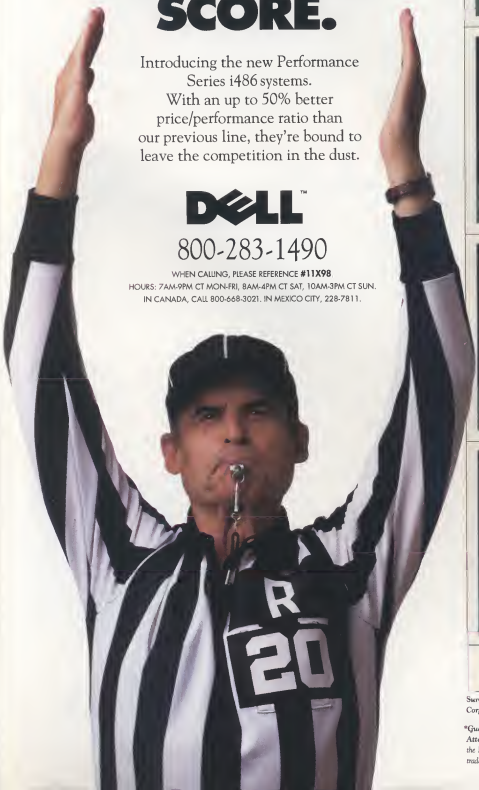

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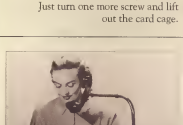

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